Dominant factors which influence wheat production in South Africa

by

Marius Bester

Thesis presented in fulfilment of the requirements for the degree of Master of Commerce in the Faculty of Economic and Management at Stellenbosch University

Supervisor: Mr Roelof Abraham Janse van Rensburg

April 2014

DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Signed: Marius Bester

Date: 1 February 2014

ABSTRACT

The protection of South Africa's agricultural sector and in context, the wheat industry, is vital to ensure the food security and rural development of the country. The wheat industry contributes about R 4 billion to the gross value of agricultural production in South Africa and currently provides about 28 000 job opportunities. Preceded by maize, wheat is the second most important grain produced in South Africa.

The phasing out of the Wheat Board in 1997, which led to the deregulation of South Africa's wheat industry, has exposed the market price of wheat to international market forces. Post-harvest agricultural logistical services have also been transformed by the deterioration of agricultural infrastructure, leading to the employment of alternative transport and storage systems.

Wheat production in South Africa has decreased significantly over the past two decades. The wheat industry is currently struggling to generate sufficient revenue for it to remain a financially viable crop. Producers are either shifting their focus to more profitable commodities or are abandoning farming altogether.

It is the objective of this study to describe and define the dominant factors which influence wheat production in South Africa. This includes all the relevant post-harvest logistical activities and market related forces which influence the production volumes of wheat in South Africa.

A qualitative research approach was undertaken to gather input data for the research presented. This was inclusive of liaising with producers as well as expert interviews with members in the wheat value chain. This provided unique and valuable insights into the dominant factors influencing wheat production in South Africa.

The research presented in this thesis concluded that wheat production in South Africa is being negatively influenced by a decrease in the market price of wheat and a further increase in the cost of post-harvest logistical services. Furthermore the market price of wheat is being lowered by the implementation of an open market policy which allows the

importation of cheap subsidized wheat. The cost of post-harvest logistical services has increased due the inefficiency of transport services resulting from a deteriorated transport infrastructure. In order to sway preference to wheat production in South Africa, government support will be required in the form of import tariffs, used to protect local farmers, and agriculture infrastructure development, which will be required to decrease the cost of post-harvest logistical services.

OPSOMMING

Die beskerming van die Suid-Afrikaanse landbou-sektor en in hierdie konteks, die koringbedryf, is noodsaaklik vir die versekering van voedselsekuriteit en landelike ontwikkeling in Suid-Afrika. Die koringbedryf dra ongeveer R4 miljard tot die brutowaarde van landbouproduksie in Suid-Afrika en bied tans sowat 28 000 werkgeleenthede. Voorafgegaan deur mielies, is koring die tweede belangrikste graan wat in Suid-Afrika geproduseer word.

Die uitfasering van die Koringraad in 1997, wat gelei het tot die deregulasie van Suid-Afrika se koringbedryf, het gelei tot die blootstelling van die markprys aan internasionale markverwante kragte. Na-oes landbou logistieke dienste is ook verander deur die agteruitgang van landbou-infrastruktuur, wat gelei het tot die ontwikkeling van alternatiewe vervoer- en berging stelsels.

Koringproduksie in Suid-Afrika het oor die afgelope twee dekades beduidend afgeneem. Die koringbedryf sukkel tans om voldoende inkomste te genereer vir produsente. Produsente verskuif tans hul fokus na meer winsgewende kommoditeite of laat vaar boerdery heeltemal.

Dit is die doel van hierdie studie om die faktore te beskryf wat koringproduksie beïnvloed in Suid-Afrika. Dit sluit in na-oes logistieke aktiwiteite en markverwante kragte wat die produksie-volumes van koring in Suid-Afrika beïnvloed.

'n Kwalitatiewe navorsingsbenadering is onderneem om insette in te samel vir die navorsing wat aangebied word. Dit sluit in onderhoude met produsente, sowel as deskundiges in die koring-waardeketting. Dit het ‘n unieke en waardevolle insig gelewer in die dominante faktore wat koringproduksie in Suid-Afrika beïnvloed.

Die navorsing wat in hierdie tesis onderneem is het tot die gevolgtrekking gekom dat koringproduksie in Suid-Afrika negatief beïnvloed word deur 'n afname in die markprys en 'n toename in die koste van na-oes logistieke dienste. Die markprys van koring word verlaag deur die implementering van 'n opemark beleid wat die invoer van goedkoop gesubsidieerde koring toelaat. Verder het die koste van na-oes logistieke dienste toegeneem weens die ondoeltreffendheid van vervoer, bygedra deur ‘n verswakte vervoerinfrastruktuur. Om voorkeur terug na koringproduksie in Suid-Afrika te swaai, sal dit die ondersteuning vereis van

die regering deur die implementering van invoertariewe, wat beskerming sal bied vir plaaslike boere, asook landbou-infrastruktuur ontwikkeling, wat die koste van na-oes logistieke dienste sal verbeter.

CONTENTS

DECLARATION ..... Error! Bookmark not defined.

ABSTRACT ..... **ii**

OPSOMMING ..... **iv**

CONTENTS ..... **vi**

LIST OF FIGURES ..... **x**

LIST OF TABLES ..... **xii**

ACRONYMS AND ABBREVIATIONS ..... **xiii**

CHAPTER 1 INTRODUCTION **1**

1.1 Introduction 1

1.2 Background and Rationale 1

1.3 Objectives 2

1.4 Contributions 3

1.5 Research Limitations 3

1.6 Layout 4

CHAPTER 2 METHODOLOGY **6**

2.1 Introduction 6

2.2 Research Design 6

2.2.1 Introduction 6

2.2.2 Type of Data Gathered 7

2.2.3 Data Sources 7

2.2.4 Data Collection Procedure 8

2.3 Data Reliability and Validation 9

2.4 Data Analysis 9

2.5 Chapter Summary 10

CHAPTER 3 LITERATURE REVIEW 11

3.1 Overview of South African Wheat Market 11

3.1.1 Introduction 11

3.1.2 The Wheat to Bread Value Chain 11

3.1.3 Trends in the South African Wheat Market 21

3.1.4 Section Summary 29

3.2 Agricultural Marketing Companies 29

3.2.1 Introduction 29

3.2.2 Agricultural Marketing Activities 30

3.2.3 Section Summary 33

3.3 Post-Harvest Wheat Handling Activities 34

3.3.1 Introduction 34

3.3.2 Sorting 35

3.3.3 Grading 35

3.3.4 Packing 37

3.3.5 Storage 37

3.3.6 Transport 38

3.3.7 Section Summary 38

CHAPTER 4 QUALITATIVE RESEARCH FINDINGS 40

4.1 Introduction 40

4.2 Theoretical Saturation 40

4.3 Market Price of Wheat 41

4.3.1 Subsidized wheat imports and Import tariffs 42

4.4 Government support 43

4.5 Transport 44

4.5.1 Location Differential System 44

4.5.2 Shift from Rail to Road 44

4.6 Development in Wheat Storage 45
4.7 Chapter Summary 46
CHAPTER 5 WHEAT TRANSPORT 47
5.1 Introduction 47
5.2 South African Wheat Transport Modes and Challenges 47
5.2.1 Road Transport 48
5.2.2 Rail Transport 53
5.2.3 Ocean Transport 57
5.3 Location Differential System 60
5.3.1 Location Differential Prices 60
5.3.2 Location Differential System Challenges 61
5.4 Chapter Summary 62
CHAPTER 6 WHEAT STORAGE 63
6.1 Introduction 63
6.2 Wheat Storage in South Africa 63
6.2.1 Wheat Storage in the Old and New Worlds 64
6.2.2 Shift in wheat storage 65
6.3 Storage Methods 66
6.3.1 Storage in Bags 66
6.3.2 Silos 66
6.3.3 Silo Bags 68
6.4 Wheat-Handling Machinery 70
6.5 Chapter Summary 71
CHAPTER 7 ECONOMIC FORCES OF INTERNATIONAL TRADE 72
7.1 Introduction 72
7.2 Landed Cost of International Wheat 73
7.3 Import Tariffs 73
7.3.1 The Effect of a Tariff 73

7.3.2 South African Wheat Tariffs 74
7.3.3 Tariff Reference Price 75
7.4 Government Support 77
7.4.1 Subsidising Programmes 78
7.4.2 Effect of Subsidies 79
7.5 Restriction on Exports 81
7.6 International Transport Cost 83
7.7 Exchange Rates 84
7.8 Chapter Summary 84
CHAPTER 8 THE ROLE OF THE SOUTH AFRICAN GOVERNMENT 85
8.1 Introduction 85
8.2 Infrastructure Development 86
8.3 Managing Wheat Reserves 87
8.4 Rural Development and Land Reform 89
8.5 Emerging Farmers 90
8.6 Chapter Summary 91
CHAPTER 9 CONCLUSION AND RECOMMENDATIONS 92
9.1 Summary 92
9.2 Key Findings 93
9.2.1 Wheat Transport 93
9.2.2 Wheat Storage 93
9.2.3 Economic Forces of International Trade 94
9.2.4 The Role of the South African Government 94
9.3 Future Research 95
BIBLIOGRAPHY 96
ANNEXURE A 2012-2013 SILO LOCATION DIFFERENTIALS 107

LIST OF FIGURES

- Figure 3-1 Amount of wheat per ton required to purchase 1000 litres of Diesel in South Africa (Grain SA, 2013A) 15
- Figure 3-2 South African Wheat, flour and bread prices (2000 – 2008) (National Agricultural Marketing Council, 2009A) 22
- Figure 3-3 South Africa wheat hectares planted ('000) (National Crop Estimates Committee, 2013) 23
- Figure 3-4 Wheat production in South Africa (000) (National Crop Estimates Committee, 2013) 23
- Figure 3-5 Wheat imports (1997/98 – 2013/14) (000) (National Crop Estimates Committee, 2013) 25
- Figure 3-6 Wheat imports 2012/2013 (ton) (South African Grain Information Service, 2013A) 26
- Figure 3-7 South African wheat imports (South African Grain Information Service, 2013B) 27
- Figure 3-8 Wheat exports 2012/2013 (ton) (South African Grain Information Service, 2013A) 27
- Figure 3-9 Average yields of wheat (Bureau for food and agriculture policy, 2005) 28
- Figure 5-1 Transport Stages 48
- Figure 5-2 Farmers loading wheat onto trailers during harvesting (DASQ, 2012) . 49
- Figure 5-3 Examples of "massabakke" used to transport wheat 50

- Figure 5-4 Condition of major road networks in South Africa (Department: Performance Monitoring and Evaluation, 2012) 51
- Figure 5-5 Rail network of South Africa (Department: Performance Monitoring and Evaluation, 2012) 54
- Figure 5-6 Wheat transport by component (South African Grain Information Service, 2013A) 55
- Figure 5-7 Ports of South Africa by Corridor They Serve (Department: Performance Monitoring and Evaluation, 2012) 58
- Figure 6-1 Galvanised grain silos on a farm near Pretoria (ABC Hansen Africa, 2012) 67
- Figure 6-2 Wheat being stored into a silo bag by using a grain bagging machine (Silobags Systems, 2012) 69
- Figure 7-1 The Effect of a tariff (Charles Sturt University, 2013) 74
- Figure 7-2 World reference price (2000 – 2013) (Van der Vyfer & Nordier, 2013) 77
- Figure 7-3 Estimated subsidies paid out to farmers in the USA (2009 – 2012) (EWG, 2013) 78
- Figure 7-4 Wheat imports from the Americas (Department of Agriculture, Forestry and Fisheries, 2012) 82
- Figure 7-5 Wheat distribution in South Africa (Department of Agriculture, Forestry and Fisheries, 2012) 83

LIST OF TABLES

- Table 2:1 Entities Contacted 8
- Table 3:1 Area planted with wheat in the South Africa (2012/2013) (National Crop Estimates Committee, 2013) 12
- Table 3:2 Variable input cost of wheat production (2013/2014) (Grain SA, 2013C) 14
- Table 3:3 Variable input cost of wheat production on land cultivated (2013/2014) (Grain SA, 2013C) 16
- Table 3:4 Strengths and weaknesses of the baking sector (Department of Agriculture, Forestry and Fisheries, 2005) 21
- Table 3:5 Wheat consumption in South Africa (Index Mundi, 2013) 24
- Table 3:6 Average yield per country (1999/2000 – 2003/04) (Bureau for food and agriculture policy, 2005) 28
- Table 3:7 Grading regulations—schematic presentation of classes and grades of bread wheat (Department of Agriculture, Forestry and Fisheries, 2010A) 36
- Table 4:1: Frequency of themes raised during interview process 41
- Table 5:1 Dry bulk throughput per port (million tons) (Department: Performance Monitoring and Evaluation, 2012) 59
- Table 6:1 Silo Bag Features (Silobags Systems, 2013) 69
- Table 7:1 World Reference Price Calculation (Van der Vyfer & Nordier, 2013) 76

ACRONYMS AND ABBREVIATIONS

DRDLR	Department of Rural Development and Land Reform
WTO	World Trade Organisation
PLK	Porterville Landbou-koöperasie
WPK	Kaap Agri
MKB	Moorreesburg Koringboere
JSE	Johannesburg Stock Exchange
NPA	National Ports Authority
TFR	Transnet Freight Rail
SAFEX	South African Futures Exchange
RDP	Rural Development Programme
ITAC	International Trade Administration Commission of South Africa
SACU	South African Customs Union
GOSA	Grain Handling Organisation of Southern Africa
HML	Hectolitre Mass
SANRAL	South African National Roads Agency SOC Limited
SAGIS	South African Grain Information Service
AgriSA	Agri South AFrica
SADC	Southern African Development Community

CHAPTER 1

INTRODUCTION

1.1 Introduction

The protection of South Africa's agricultural sector and more specifically, the wheat industry is vital to ensure the food security and rural development of the country. The wheat industry contributes about R 4 billion to the gross value of agricultural production in South Africa and currently provides about 28 000 job opportunities. Preceded by maize, wheat is the second most important grain produced in South Africa (Van der Vyfer & Nordier, 2013).

Wheat production in South Africa has decreased significantly over the past two decades (Van der Vyfer & Nordier, 2013). The wheat industry is currently struggling to generate sufficient revenue for it to remain a financially viable crop (Visser, 2010). Producers are either shifting their focus to more profitable commodities or are abandoning farming altogether.

1.2 Background and Rationale

The competitiveness of the South African wheat industry can be measured by the industry's ability to generate profit. The market price of wheat which is estimated in the open market, minus the cost of post-harvest logistical and marketing services, determines the revenue received by producers in South Africa. Profit margins are calculated by subtracting the variable input cost of wheat production from revenue received (National Agricultural Marketing Council, 2010).

The industry has experienced significant change over the past two decades. The wheat market was deregulated by the abolishment of the Wheat Board in 1997 (Department of Agriculture, Forestry and Fisheries, 2010B). The market price, provided by the South African Futures Exchange (SAFEX), is freely determined in the open market.

Since the deregulation of the South African wheat industry, the competitiveness of the South African wheat market has been influenced by a number of fundamental factors. These include variable forces related to the open market, influencing the market price that wheat producers receive, and the economy of post-harvest services, required to facilitate distribution in the wheat to bread value chain.

The South African wheat industry is further forced to compete with international wheat markets. The landed cost of imported wheat negatively influences the local demand for domestic wheat (Tsengiwe, 2013).

The marketing channel of wheat in South Africa is transport intensive and producers are required to cover the cost of post-harvest logistical expenses. The efficiency of transport, storage and other wheat handling services are influenced by agricultural infrastructure development (Bureau for food and agriculture policy, 2005).

South Africa will produce short of 1.9 million tons of wheat in the marketing year of 2012/13, compared to the 2 million tons of wheat produced in 2011/12 (National Crop Estimates Committee, 2013). The decrease in production can be attributed to the result of a decline in the number of hectares planted with wheat from the previous year (Van der Vyfer & Nordier, 2013). To supplement domestic production, South Africa had to import an estimated 1.5 million tons of wheat in 2013 from international markets (National Crop Estimates Committee, 2013).

Based on the aforementioned, the need to fully investigate, interpret and analyse all the processes involved in post-harvest activities, which are paramount to the competitiveness of the industry, is justified.

1.3 Objectives

This thesis presents an elucidation of post-harvest activities within the wheat production industry. It further describes market related factors and post–harvest logistical activities which influence the competitiveness of the South African wheat market. This includes describing current transport, storage and other wheat handling activities, and variable market related forces.

The objectives of this thesis are:

1. To obtain a complete overview of the South African wheat market.

2. To establish and to provide explanations for the current trends in the wheat industry.
3. To describe agricultural marketing companies, and the new role they play in the sector.
4. To investigate and evaluate all the activities from after harvesting to milling.
5. To obtain inputs from stakeholders in the post-harvest value chain, and to collate the findings to allow for further analysis.
6. To analyse the dominant influences on the revenue of the producers.
7. To discuss and interpret the influences of the economic forces of international markets and the effect they have on the local market.
8. To discuss the potential role the South African government can play in the advancement of the industry.

Objectives 1 to 5 are considered initial objectives to allow for the accomplishment of Objectives 6, 7 and 8. As stated in the title of this thesis these initial objectives will too determine the dominant factors which primarily influence the wheat market of South Africa.

The study will focus primarily on changes in the wheat market from 1990 until the current production year.

1.4 Contributions

The research contributions made in this thesis:

- Provided a holistic overview of post-harvest wheat handling (logistical) activities.
- Provided a complete analysis on the dominant post-harvest factors and the corresponding impact they have on the market value of wheat in South Africa.
- Provided a better understanding as to the reasons for the local decline in the amount of wheat planted and hence available on the market.

1.5 Research Limitations

This thesis aims to present a holistic view of the South African wheat market, with specific focus on the impact post-harvest operations have on the production volume. This is inclusive of an entire supply chain analysis as well as the impact of the exposure to international market trends.

Bearing this in mind the following limitations were identified:

The study considered only the post-harvest processes and their inherent implications and did not consider the pre-harvest production processes. This may well be considered an influence on the production volumes. Development of new technologies and techniques during the planting, growing and harvesting of the crop were considered outside the scope of this thesis.

The predilection of wheat as opposed to other crop variants in terms of pre-harvest considerations was not investigated. Particularising new developments that may have resulted in easier and cheaper production of different crop variants were considered too indefinite, although this may be perceived as a limitation on the analysis of influences of wheat production volumes.

Interviewee bias (which may result in interviewer bias) may be considered a limitation to this study as analysis and interpretation of the questionnaire reflect their personal opinion based on their perception of the industry and markets (for the instances where analysis was conducted). The researcher has set precautions that aim to eliminate this during the interview and analysis process. These precautions include the aim of achieving theoretical saturation with the data obtained in the interviews as well as concluding the interviews with role-players in the post-harvest process (i.e. domestic wheat producers, agricultural logistics experts and commodity trading experts).

A total of ten interviews were preliminary considered to evaluate the sample space. Although the amount of interviews conducted might be considered a limiting factor, the author has committed to achieve theoretical saturation, as well as the verification thereof, on all discussion points. Verification was achieved through establishing recurring subjects in the 80 percentile majority of the sample space, i.e. interviews conducted on which the interviewee had conclusive knowledge.

1.6 Layout

This thesis is organised according to the following topics:

The research methodology, presented in chapter two, defines the type of data that needs to be gathered, the procedure for obtaining it, the verification of the quality thereof and the procedure of the analysis. The literature review, investigating previous research and publications on topics of relevance to this thesis, is presented in chapter three. This chapter

presents an overview of the South African wheat market and an investigation into the operational activities of agricultural marketing companies to identify their influence on the competiveness of the South African wheat industry. These companies bridge the gap between producers and processors by offering both marketing and logistical services for wheat producers. This chapter further discusses the nature and elements of post-harvest wheat handling activities within the supply chain of the crop. This provides insights into the handling cost that is a critical consideration on profits of wheat producers.

Chapter four presents the findings of this investigation.

Chapter five and six further investigate and discuss the dominant elements of the post-harvest wheat handling activities, i.e. the transport and storage expenditure.

Chapter seven investigates wheat trading from an economic perspective. The large amount of wheat imported into the South African market bind the local market price to international trade regulations and other economic activities, which in turn directly influence the wheat price.

Chapter eight discusses the role as well as the potential role the South African government can play in the regulation of the industry.

The final chapter provides the conclusions and the findings of this thesis.

CHAPTER 2

METHODOLOGY

2.1 Introduction

The research methodology is the process that defines the type of data that needs to be gathered, the procedure for obtaining it, the verification of the quality thereof and the procedure of the analysis. The reliability of the data and techniques used to gather the data is of paramount importance as it has a significant impact on the results and therefore the conclusions derived from the overall study.

The following sections provide a brief overview of the procedure that was undertaken to implement this study.

2.2 Research Design

2.2.1 Introduction

The study aims to explore post-harvest logistical services and the dominant factors which influence the wheat industry and wheat market price in South Africa.

This research is a qualitative study. In-depth interviews were conducted as they provide abundant information for exploratory and inductive studies (Elg, U, et al., 2008) . The qualitative research approach was chosen to obtain information which may have been difficult to obtain quantitatively.

The guidelines for qualitative research as developed and set by (Hoepfl, 1997) were implemented to ensure complete and thorough procurement of relevant data.

2.2.2 Type of Data Gathered

Domestic wheat producers and individuals working in organizations, which provide logistical and marketing services, within the South African wheat market were identified. Samples of these individuals were interviewed with the purpose of obtaining better insights into the dominant economic post-harvest factors which influence market performance.

The interviews conducted were separated into three different groupings of respondents in order to get multiple views and different levels of expertise:

- Domestic wheat producers
- Agricultural logistics experts
- Commodity trading experts

Domestic wheat producers were interviewed to determine their views regarding logistical and market related forces which dictate their revenue. The information obtained here formed the bulk of the data gathered. The aim of gathering this information was to identify the dominant factors that contribute to the apparent decline in wheat production in South Africa.

Expert interviews and other qualitative sources enabled the exploration, classification and substantiation of these factors. Furthermore, it assisted in identifying additional post-harvest logistical and market related variables which affect the wheat market in general.

2.2.3 Data Sources

This thesis contains 10 interviews: 7 Wheat producers, one former wheat producer and agricultural transport service provider, one expert interview with a wheat logistical service provider and one expert interview with an agricultural trader specializing in the trading of future wheat contracts. The interviews covered the dominant factors which influence the wheat market of South Africa. The interviews were conducted using a set of semi-structured questions that acted as a guide and were based on the literature review. This will further be discussed in the following section.

The table below indicates the entities, their role as well as the region of operation that were contacted during this study.

Table 2:1 Entities Contacted

Farm/Company	Description	Region
Farm Brakfontein	Wheat producer 1	Overberg
Farm Schoongezicht	Wheat producer 2	Swartland
Farm Jakkalsfontein	Wheat producer 3	Overberg
Farm Wadrift	Wheat producer 4	Overberg
Farm Perdedam	Wheat producer 5	West Coast
Farm Swartheuwel	Wheat producer 6	Overberg
Farm Nuweput	Wheat producer 7	Overberg
Farm Morelug	Former wheat producer and agricultural transporter	Overberg
Agricultural Commodity Trading Company	Commodity Trader	International
Agricultural Marketing Company	Logistics Analyst	National

2.2.4 Data Collection Procedure

The following provide a brief exposition of the procedure undertaken to obtain the information stated in Section 2.2.2:

The interview process consisted of face-to-face and telephonic interviews. Semi-structured interviews were used as a primary method for collecting data. An interview guide was designed to ensure that there was consistency in the data by addressing the same information themes in all the interviews. This helped to ensure that there were no pre-determined responses. The interview guide was designed with existing literature and the objectives in mind.

The following questions were asked during the interviews:

1. What are the perceived competitive influences on the South African wheat market?
2. What factors are predominantly considered to influence market value?
3. What is the entity's opinion on current national policies, of importing wheat from cheaper international sources?

4. What is the entity's opinion on the effectiveness of the Rural Development Programme (RDP) specifically referring to emerging farmers' ability to produce and stimulate the market?
5. What protection and alleviation can be obtained against international tendencies?
6. How do you address and minimise transportation costs, of the Location Differential System?
7. What is the opinion of the entity regarding storage and the influence this has on the profit?

This set of questions served as the starting point for discussions addressing the central theme within each question.

2.3 Data Reliability and Validation

The semi-structured interview approach was used to overcome any bias that might influence the reliability of the data (further discussed in the following section on the limitations of this study). All participants were given the background of the study, prior to being interviewed.

Information gathered from interviews with wheat producers in South Africa pin pointed the dominant market related forces and post-harvest factors which influence the competitiveness of local wheat farmers in South Africa. While expert interviews and other qualitative sources enabled to explore certain areas in detail which ensured that a comprehensive and objective conclusion was reached.

The emergence of themes within interviews (theoretical saturation) also served as validation of certain standpoints.

2.4 Data Analysis

To analyse the data, common themes were identified from interviews and other qualitative sources. The themes are aligned with the themes that come through in the literature review.

The data analysis procedure was completed as a combination of three components as proposed by Leedy and Ormond (2008):

1. **Narrative enquiry –** Addressing the questions stated in Section 2.2.4 the interviewee provides opinions and statements; it also starts a somewhat random discussion on the topic. The interviewer grouped these responses to construct a composite.
2. **Constant comparative –** After the interview the data was grouped and responses on themes compared.
3. **Content analysis –** This process was conducted concurrently with the previous two and allows for a systematic and detailed examination of the content data to identify themes or patterns.

The interviews were conducted until such time as the author had the confidence in the reliability and validity of the interview findings. Findings were noted and further conclusions drawn based on the themes derived.

2.5 Chapter Summary

The research methodology proposed herein defined the type of data that needs to be gathered, the procedure of obtaining it, the verification of the quality thereof as well as the procedure of the analysis.

This methodology provided the structure and the framework to enable the successful completion of this thesis.

CHAPTER 3

LITERATURE REVIEW

3.1 Overview of South African Wheat Market

3.1.1 Introduction

This section aims to present a complete overview of the South African wheat market. This will be accomplished through a thorough investigation into the geographical position of wheat producers in the supply chain, the role of intermediate service providers and the organizations and industries involved in the wheat value chain.

A supply chain is the sequence of processes involved in the production and distribution of a commodity. A value chain is defined as a group of interlinked value-added activities by which a company adds value to a commodity, including production, marketing, and the provision of after-sales service.

The International Trade Administration Commission of South Africa (ITAC) has recognised the following trends in South Africa's wheat industry; a decrease in wheat production, a rise in imports, falling employment and a rise in food prices (Tsengiwe, 2013). This has been accompanied by increased efficiency, productivity and quality (National Crop Estimates Committee, 2013). These trends beg the question: What is constraining the competitiveness of the South African wheat industry? This section will further investigate this question.

This section addresses research objectives 1 and 2 (refer to Section 1.3).

3.1.2 The Wheat to Bread Value Chain

In order to investigate logistical functions and marketing factors which influence the competitiveness of South African wheat in South Africa, the wheat value chain will be defined. This will include discussing wheat producers, wheat storage facilities, agricultural marketing

companies, the milling industry and the baking industry. Although the focus of this study revolves around post production, a brief overview of the input cost and production process of wheat farming in South Africa will be provided.

3.1.2.1 Wheat producers

Wheat producers, also known as farmers, are the point of origin in the wheat value chain (Department of Agriculture, Forestry and Fisheries, 2005). Wheat producers directly determine the wheat production output South Africa by the number of hectares planted with wheat (Department of Agriculture, Forestry and Fisheries, 2010B).

3.1.2.1.1 Wheat producing areas of South Africa

Wheat is produced throughout South Africa, with the Western Cape, Northern Cape and Free State provinces accounting for the majority of output (Department of Agriculture, Forestry and Fisheries, 2012). Referring to Table 3:1, the hectares planted with wheat as well as estimated production yield per province for production year 2012/2013 can be viewed. The Western Cape, with an estimate of 272 000 hectares planted, will have the biggest contribution to the total wheat production output in 2012/2013, followed by the Free State.

Table 3:1 Area planted with wheat in the South Africa (2012/2013) (National Crop Estimates Committee, 2013)

	2012/13	2012/13	2012/13
Regions	**'000 ha**	**'000 t**	**t/ha**
W. Cape	272.0	884.0	3.3
N. Cape	42.0	289.8	9.9
Free State	130.0	377.0	2.9
E. Cape	4.5	20.7	4.6
Kwazulu-Natal	6.5	33.8	5.2
Mpumalanga	4.7	27.3	5.8
Limpopo	30.0	159.0	5.3
Gauteng	1.5	9.8	6.5
North West	20.0	144.0	5.7

3.1.2.1.2 Production process

Wheat is planted between April and June in the winter rainfall area and between May and the end of July in the summer rainfall areas. Approximately 20% of wheat planted in South Africa is cultivated under irrigation and 80% under dry land conditions (Department of Agriculture, Forestry and Fisheries, 2005). The life cycle of wheat is the same for all species, though it can take place at different times. Typically it takes about seven to eight months for a wheat plant

to reach maturity. The operational procedure of wheat producers consist of the planting of wheat seeds in fertilized soil to ensure a healthy and disease-free environment. (Westfall & Davis, 2013) The seedling passes through several stages of growth until a tiny seedling breaks the surface of the soil. Stems, called tillers, branch out from the main shoot of the growing seedling, and groups of flowers, called spikes, develop at the top of each tiller. The spikes mature to form wheat heads, each bearing between 50 and 75 individual kernels (Chapman & Hodges, 2011). The colour of the kernel will change from a green to a light yellow when reaching maturity before gradually taking on its mature colour (red in the case of hard red winter wheat). Disease, insect damage, nutrient, heat and water stress can influence the colour of the plant and can therefore indicate the physiological maturity of the plant. (University of Saskatchewan, 2013).

After the wheat plant has matured, the wheat is ready to be harvested. The wheat must be dry before it can be harvested. (Department of Agriculture, Forestry and Fisheries, 2009) A combine harvester is used to reap the stalks; thresh the kernels from the stalks; load the kernels into a grain cart; and eject the remaining straw (Inglett, 1974). After the wheat is harvested, it is transported to a temporary storage facility before being purchased. The transport can be done either by the producer himself or by a transport contractor, with the producer owning responsibility.

3.1.2.1.3 Input cost

The input cost of wheat farming is separated between variable and overhead cost (O'Donovan & O'Mahony, 2012). The relative contribution of a variable input cost to total variable input cost varies between regions due to varying soil and rainfall patterns that influence the requirements for fertilisers, lime and pesticides (Metho, 1999). By referring to Table 3:2, an estimate of the variable cost for production year 2013/2014 can be viewed for conventional wheat farming in dry land. This includes an estimate of the variable input cost per hectare at different levels of efficiency (tons/hectare). The table provides a complete overview of all current variable inputs, which predominantly consist of seed, chemicals, fuel, risk management and financing expenses.

Table 3:2 Variable input cost of wheat production (2013/2014) (Grain SA, 2013C)

Planned yield (tons /ha)	**0.8**	**1.3**	**1.8**	**2.3**	**2.8**	**3.3**
Variable cost (R/ha)						
Seed	401.3	401.3	401.3	401.3	401.3	401.3
Fertilizers	1740.0	1740.0	1740.0	1740.0	1740.0	1740.0
Lime	75.0	75.0	75.0	75.0	75.0	75.0
Fuel	611.9	636.8	661.7	686.5	711.4	736.3
Repairs	481.3	484.3	487.4	490.5	493.5	496.6
Herbicides	319.8	319.8	319.8	319.8	319.8	319.8
Pesticides	220.2	220.2	220.2	220.2	220.2	220.2
Input Insurance	62.4	101.4	140.4	179.4	218.5	257.5
Grain price hedging	355.0	368.1	381.2	394.3	407.4	420.6
Crop Insurance	137.9	224.1	310.3	396.5	482.7	568.9
Air services	100.0	100.0	100.0	100.0	100.0	100.0
Packing and Packaging Material	0.0	0.0	0.0	0.0	0.0	0.0
Production credit interest R / ha	315.3	327.0	338.6	350.2	361.9	373.5
Total variable (R/ha)	**4820.0**	**4997.9**	**5175.7**	**5353.6**	**5531.5**	**5709.4**

Production input costs have increased during the past few years due to substantial increases in the cost of fertilisers and fuel (Middelberg, 2013). The input cost of fertiliser contributes on average between 30 % and 50 % to the variable grain production costs in South Africa (Grain SA, 2012). The South African fertilizer industry is a deregulated environment and is fully exposed to world market forces with no import tariffs or government sponsored measures (Natural Resources Management and Environment Department, 2005). South Africa is a net importer of potassium, a nutrient used in wheat fertilizers, and imports approximately 50% of its nitrogen requirements (National Agricultural Marketing Council, 2010). Domestic prices of wheat fertilizers are therefore impacted by international raw material prices, shipping costs and the Rand/Dollar exchange rate.

Fuel has the second highest contribution to the total variable input cost of wheat production in South Africa. Brent Crude oil price and Rand/dollar exchange rate determines the price of Diesel in South Africa. The wholesale diesel price in South Africa has increased by 5.9% from June 2012, priced at R11.37 per litre in June 2013 (Grain SA, 2013A). The slight increase in the price of Brent Crude Oil and a far weaker Rand experienced in 2013 (Exchange Rates UK, 2013) have contributed to this increase. Referring to Figure 3-1, the increase in the annual amount of wheat per ton required to purchase 1000 litres of Diesel in South Africa can be seen. This is the cost of 1000 litres of fuel divided by the market price of wheat per ton.

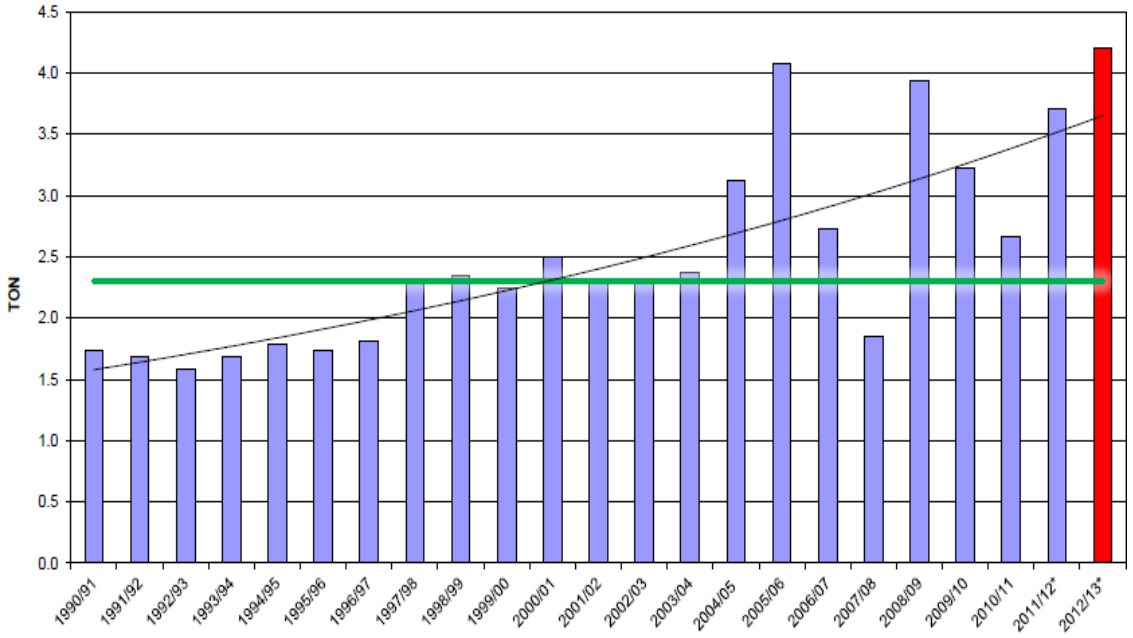

Figure 3-1 Amount of wheat per ton required to purchase 1000 litres of Diesel in South Africa (Grain SA, 2013A)

The level of yield has a major influence on profitability. Input strategies can be tailored for individual fields and farms (O'Donovan & O'Mahony, 2012). Referring to Table 3:3, an estimate of the total variable input cost for wheat production in dry land for production year 2013/2014 can be viewed of wheat produced on land cultivated with the planting of canola and lupines. Land preparation, or tillage, influences total variable input cost. Seed, fertilizing requirements, fuel and risk management expenses, as can be seen Table 3:3, are all affected by different means of cultivation or land preparation. (Bureau for food and agriculture policy, 2005).

Table 3:3 Variable input cost of wheat production on land cultivated (2013/2014) (Grain SA, 2013C)

Planned yield (tons /ha)	2.5	3	3.5	2.5	3	3.5
Variable cost (R/ha)						
Seed	331.0	331.0	331.0	401.3	401.3	401.3
Fertilizers	1880.0	1880.0	1880.0	1490.0	1490.0	1490.0
Lime	75.0	75.0	75.0	75.0	75.0	75.0
Fuel	408.2	433.1	458.0	408.2	433.1	458.0
Repairs	401.1	404.2	407.2	401.1	404.2	407.2
Herbicides	308.5	308.5	308.5	308.5	308.5	308.5
Pesticides	220.2	220.2	220.2	220.2	220.2	220.2
Input Insurance	194.7	233.7	272.6	142.2	170.6	199.1
Grain price hedging	373.7	387.0	400.2	335.1	347.8	360.6
Crop Insurance	441.1	529.3	617.6	463.0	555.7	648.3
Air services	100.0	100.0	100.0	0.0	0.0	0.0
Packing and Packaging Material	0.0	0.0	0.0	0.0	0.0	0.0
Production credit interest R / ha	331.3	343.1	354.9	297.1	308.4	319.8
Total variable (R/ha)	**5064.8**	**5245.0**	**5425.2**	**4541.7**	**4714.7**	**4887.8**

As in post-production costs, producers have minimum power over variable input costs, and are considered as price takers. Although producers in South Africa have strong production knowledge and expensive crop insurance; imperfect competition within the fertilizer industry (Middelberg, 2013) and the cost of fuel are factors which are currently restricting cost efficiency for producers in South Africa.

3.1.2.2 Storage Industry

After harvest, wheat is temporarily stored before being transported to the milling industry (O'Donovan & O'Mahony, 2012). Storage facilities can be located either at a central point in a farming community or on the premises of the producer (Department of Agriculture, Forestry and Fisheries, 2010B). Several methods of storage are used, with continuous development in current methods. This includes the manual storage of wheat in bags, the bulk storage of wheat in concrete silos or grain elevators, or more recently, using silo bags for on-farm storage systems.

Wheat needs to be stored in order to supply the continuous demand for wheat throughout the year and also to create a safety buffer in times of low production (Lynton-Evan, 1997), caused by droughts. Storage facilities also provide the ability for producers to respond to changes in market conditions and provide time for producers to sell wheat in more favourable market

conditions. With high input costs, producers are not always in a strong position to wait for and respond to more favourable market conditions (Department of Agriculture, Forestry and Fisheries, 2010B). Wheat, in most cases, needs to be sold quickly to cover the cost of production. Wheat storage facilities can be owned by agricultural corporations, jointly owned by farmers in the community and agricultural marketing companies (Bureau for food and agriculture policy, 2005).

The grain storage and handling sectors are dominated by a few main players. Up to 85% of silo capacity is owned by 22 silo owners. In fact, a total of just over 70% is owned by a mere three co-operatives; namely Senwes Limited, Afgri and Noordwes (Higgins, 2010).

3.1.2.3 Agricultural marketing companies

Up until the 1990s, the marketing of wheat was extensively regulated by the state through the Marketing Act (Act 27 of 1937) (consolidated in the Marketing Act (Act 59 of 1968)) (OECD Review of Agricultural Policies, 2006). The Wheat Board was the main intermediary between the farmer and the milling industry. With the marketing of wheat regulated through a single channel marketing system administered by the Wheat Board (Mncuba, 2011). The Wheat Board was the sole buyer and seller of wheat at predetermined prices.

The introduction of the Marketing of Agricultural Products Act (Act 47 of 1996) has however influenced the structure of the supporting institutions in South Africa's wheat industry (Ministerial Committee to Review Agriculture Marketing, 2006). The closure of the South African Wheat Board has led to an increase of privately owned agricultural marketing companies (Department of Agriculture, Forestry and Fisheries, 2010B). Agricultural marketing companies are enterprises which focus on the delivery of marketing and logistical services in the agriculture sector in order to facilitate distribution (BKB, 2013). Agricultural marketing companies also include former agricultural co-operatives which have been converted into agri-businesses (Department of Agriculture, Forestry and Fisheries, 2003A)

Agricultural marketing companies are actively involved in the trading of future contracts which enable them to fund the input costs of producers and in doing so, encourage a sustainable production. Future contracts are used by farmers who want to hedge their price risk against market uncertainty (SAFEX Agricultural Trading, 2013). Producers or traders can also register a derivative trading account through agricultural marketing companies and are able to call on experienced derivative traders for assistance in constructing sensible and effective hedging strategies (Bester Feed & Grain, 2013A).

Besides derivative trading, agricultural marketing companies may also provide transport, storage, grading and other wheat handling services. Logistical services can be provided by means of in-house services or a network of contracted service providers (BKB Logistics, 2013). The role and contribution of agricultural marketing companies to the South African wheat market will be discussed in Chapter 3.2.

3.1.2.4 Milling Industry

The South African Milling industry is a well-organized industry with a sound infrastructure (The Wheat Steering Committee, 2002). The milling industry in South Africa is dominated by four major milling companies, including Tiger Milling Company, Pioneer Foods, Foodcorp and Premier Foods, previously known as Genfoods (Higgins, 2010). Up until 1997, the milling industry was regulated by the Wheat Board which instituted weight regulations on bread loaves and controlled the price of wheat (Pioneer Foods, 2013). The milling industry was also obligated to purchase all domestically produced wheat (OECD Review of Agricultural Policies, 2006).

Since the deregulation of the South African wheat industry and the abolishment of the Wheat Board, the price of wheat can be determined freely by the milling industry in the open market (Department of Agriculture, Forestry and Fisheries, 2012). Although 1997 marked the beginning of deregulation, the aim of progressing towards an accessible, decentralised, competitive and commercially viable industry has been unsuccessful. Substantial technology, knowledge-share deficits; restricted training, and finance options as well as escalating logistical costs have prevented the development of a small-medium-scale milling sector to alleviate the current food price and rural unemployment crises (Higgins, 2010). The number of wheat mills in South Africa has also dropped from 137 mills in 1996/97 to 103 mills in 2002/03 with approximately 97% of wheat in South Africa being milled by 33 milling companies (Department of Agriculture, Forestry and Fisheries, 2005).

This milling industry turns wheat into flour using different parts of the wheat grain to make different types of flour (Grain Chain, 2013). This may include brown bread flour, whole-wheat flour, white bread flour, cake flour, self-rising flour and industrial flour (Department of Agriculture, Forestry and Fisheries, 2005). The wheat milling process consists of three stages: In the break process, roller mills are used to gently crack the wheat kernel open to prepare the wheat for further processing, with the aim of removing as much of the bran (the skin of the wheat berry) from the endosperm (the grain kernel) (Inglett, 1974). In the scraping process, the endosperm is scraped from the bran and is refined by means of roller mills, sifting

machines and purifying methods. In the reduction process, the endosperm is finally refined by means of smooth roller mills and graded by sifting machines (The Wheat Steering Committee, 2002). After the different parts of the kernels have been separated and ground, they can be blended together once more, in order to create different types of flour (Grain Chain, 2013).

Wheat mills need to have systems for grading the different types of flour. Commercial bakeries demand detailed grading, as they need precise and consistent flour characteristics for manufacturing wheat products (Engelbrecht, 2008). Flour is graded based upon texture, protein, ash content and other physical and chemical measurements (Baloch, 1999). Although milling operations in South Africa have been quite traditional, there have been some technological improvements in the production stage, with milling companies implementing modern practices, while always looking to maximise efficiency (The African Business Journal, 2013). Once the process has been completed, flour is stored into bags and is ready to be shipped.

In 2007, 17 major milling companies, including Tiger Brands and Pioneer Foods, were cited by the Competition Commission of South Africa for their involvement into price fixing (Higgins, 2010). An investigation by the Commission revealed that through meetings and telephone discussions, firms agreed to fix prices of milled wheat products. This included creating uniform price lists for wholesale, retail and general trade customers as well as agreeing on the timing of price increases and implementation. As a penalty, milling companies involved were issued with heavy fines which were used to fund the promotion of competitiveness, employment and growth in food value chains (Competition Commission of South Africa, 2010).

3.1.2.5 Baking Industry

The baking industry is integrated with the milling industry. Prior to 1997, the baking industry was also regulated by the Wheat Board, empowered by the Marketing Act (Act 27 of 1937). (Mncuba, 2011). The baking industry is the second most important supplier of energy (kilojoules) in the national diet of South Africa, after maize meal (The Wheat Steering Committee, 2002)

The major product of the baking industry is bread with 70 to 80 percent of all flour being used for bread baking (Department of Agriculture, Forestry and Fisheries, 2012). The categories of bakers in the baking industry as defined in the South African Chamber of Baking's constitution are: wholesale bakers who operate industrial (plant) bakeries, independent bakers who operate stand-alone bakeries, retail bakers who operate in-store bakeries, and emerging

bakers who are previously disadvantaged bakers using less than 1 000 kg of flour per week (Erasmus & Cownie, 2002)

The deregulation of the South African baking industry led to the removal of control measures used to promote utilization, ensuring stability and keeping the price of wheat products affordable (Vink & Kirsten, 2002). Examples include the removal of the bakery registration, the bread subsidy, retail price control, fixed prices for bakers, state control of imports and exports and fixed price single channel marketing (Erasmus, 2013). The deregulation has resulted in the downscaling of wholesale (industrial/plant) bakeries alongside an increasing prevalence of small and medium sized bakeries. There are currently an estimated 600 in-store bakeries in the major supermarket groups, 250 franchise bakeries and 3 500 to 4 500 small independent bakeries and in-store café bakeries in South Africa (South African Chamber of Baking, 2013).

Most of the major millers in South Africa have vertically integrated with bakeries. Tiger Brands, for instance, has a controlling interest in the Spar retail group as well as interests in grain milling. Due to difficulties in accessing finance, wheat imports and the hedge on SAFEX, most small scale millers in South Africa are unable to vertically integrate with bakers (Louw , et al., 2010).

By referring to Table 3:4, major strengths and weaknesses of the South African baking sector can be viewed. Major strengths include a constantly growing domestic market with an established infrastructure. A major weakness in South Africa's baking sector is the noncompliance and quality control of informal bakeries to bread mass regulations (Department of Agriculture, Forestry and Fisheries, 2005). South Africa has an estimated 52 200 informal bakers who operate in non-licensed premises (Department of Agriculture, Forestry and Fisheries, 2012).

Table 3:4 Strengths and weaknesses of the baking sector (Department of Agriculture, Forestry and Fisheries, 2005)

Strengths	Weaknesses
Stable market, particularly for bread	Uninformed and inexperienced entrants into the baking industry
Market growth, particularly for confectionery products	Noncompliance with bread mass regulations
A diversified product market	Limited commitment to training and BEE and women empowerment
Strong domestic market	Overall poor legislative control and non-uniform quality control
Use of first world baking technology, processes and equipment	
A strong core of dynamic entrepreneurs and baking specialists	

3.1.3 Trends in the South African Wheat Market

Figure 3-2 shows the increase in the price of wheat, flour and bread from January 2000 to 2008. A major issue in the wheat industry is the price the producer receives which is much lower than the price charged by millers and bakers for flour and bread. This suggests that agro-processors are taking the majority share of the price increases (Louw , et al., 2010). This situation is aggravated by the import protection over the past 20 years of domestic flour producers. The protection of flour producers in South Africa has been more effective than the import protection of wheat imports (Flatters, 2002). Wheat producers are then at the mercy of foreign imports and are greatly affected by low producer prices.

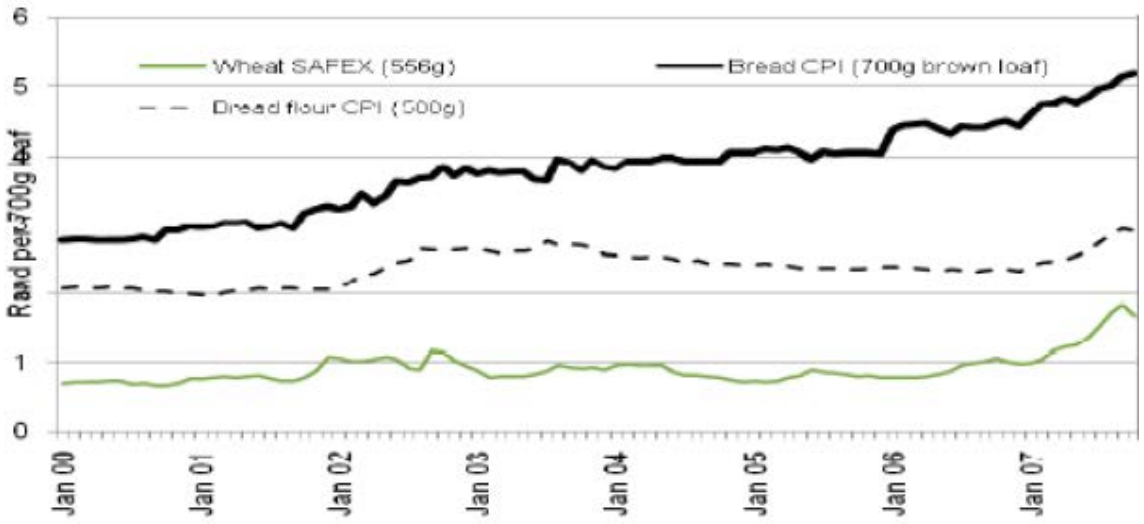

Figure 3-2 South African Wheat, flour and bread prices (2000 – 2008) (National Agricultural Marketing Council, 2009A)

A study by ITAC, has recognized a reduction in the total area planted, falling exports and rise in imports (Tsengiwe, 2013). This has been accompanied by increased efficiency, productivity and quality (Van der Vyfer & Nordier, 2013).

By referring to Figure 3-3, a decrease in hectares planted with wheat can be viewed, dropping from approximately 1500 hectares in production year 1990/91 to an estimated 500 hectares in the current production year (National Crop Estimates Committee, 2013). Referring to Figure 3-4, the annual wheat production output in South Africa can be viewed, indicating a marginal drop in output since 1996/97, attributed to the decrease in area planted with wheat (Middelberg, 2013).

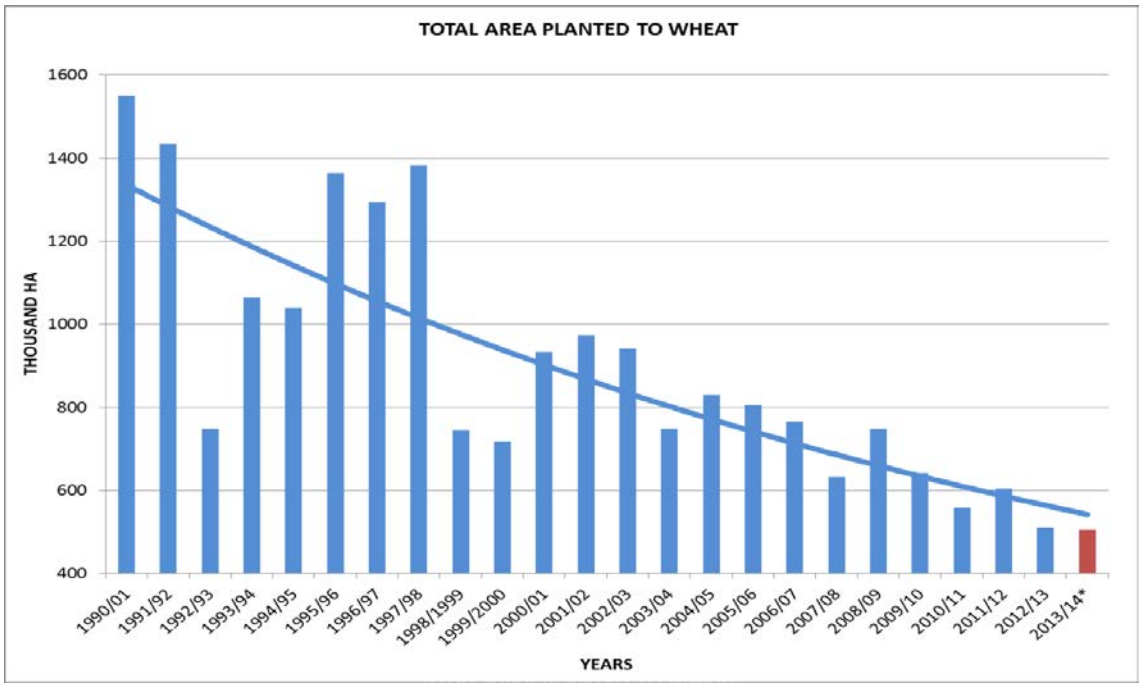

Figure 3-3 South Africa wheat hectares planted ('000) (National Crop Estimates Committee, 2013)

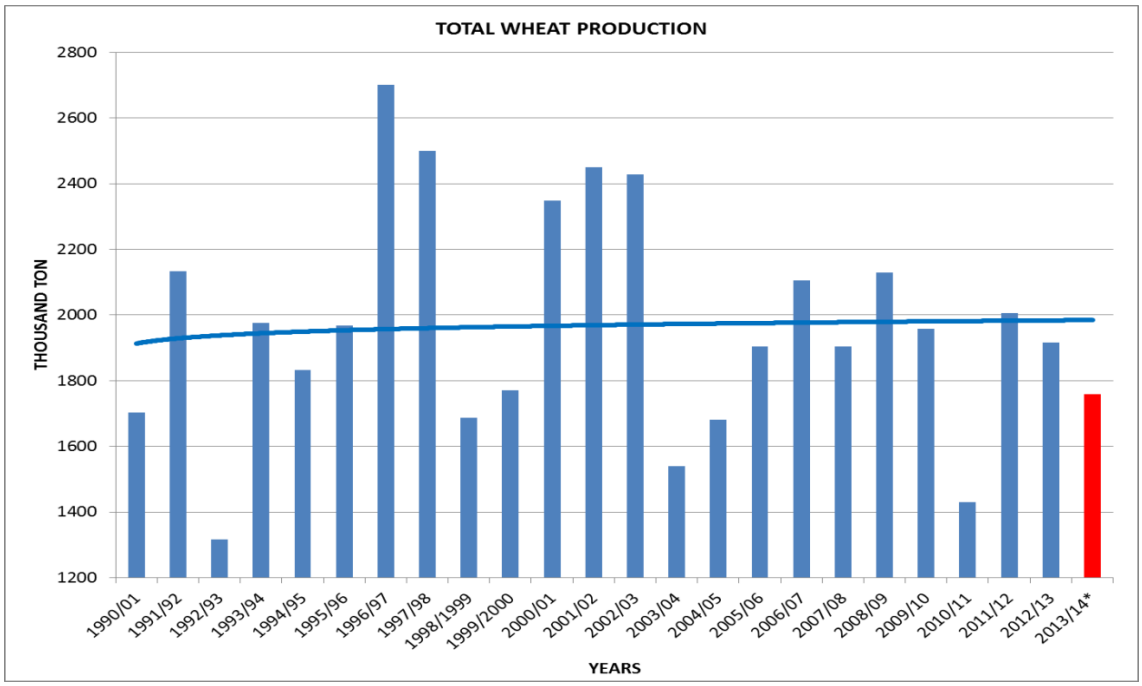

Figure 3-4 Wheat production in South Africa (000) (National Crop Estimates Committee, 2013)

Table 3:5 indicates annual wheat consumption in South Africa. The increase in demand can be attributed to South Africa's average population growth rate of 1.75% from 1990 until 2012 (World Bank, 2013).

Table 3:5 Wheat consumption in South Africa (Index Mundi, 2013)

Year	Consumption	Growth	Year	Consumption	Growth
1990	2295	-1.88%	2002	2570	0.00%
1991	2177	-5.14%	2003	2740	6.61%
1992	2198	0.96%	2004	2770	1.09%
1993	2468	12.28%	2005	2810	1.44%
1994	2506	1.54%	2006	2810	0.00%
1995	2521	0.60%	2007	2860	1.78%
1996	2834	12.42%	2008	3000	4.90%
1997	2667	-5.89%	2009	3050	1.67%
1998	2609	-2.17%	2010	2980	-2.30%
1999	2650	1.57%	2011	3211	7.75%
2000	2650	0.00%	2012	3340	4.02%
2001	2570	-3.02%	2013	3500	4.79%

Prior to the deregulation of the wheat industry, the Wheat Board controlled imports and exports of wheat and wheat flour (The Wheat Steering Committee, 2002). The Board was the sole buyer and seller of wheat at predetermined prices while the milling industry was obliged to purchase all locally produced wheat. (Mncuba, 2011). Since the liberation, wheat can now be traded freely, allowing the importing and exporting of internationally and locally produced wheat (Vink & Kirsten, 2002).

By comparing Table 3:5 to Figure 3-4, a deficit between the annual wheat demand and production output in South Africa since 1990, can be viewed. In order to supply the deficit between demand and production, South Africa needs to import wheat from international markets (Bureau for food and agriculture policy, 2005). Figure 3-5 indicates the increase in annual wheat imports into South Africa over the last 16 years. What is evident in Figure 3-5 is the relationship between wheat imports and wheat production. Estimates by the National Crop Estimates Committee indicates that a lower production output, as was the case between 2003 and 2006, results in a greater number of wheat imports, with more than 1 million tons of

wheat imported consecutively between 2003 and 2006 (National Crop Estimates Committee, 2013).

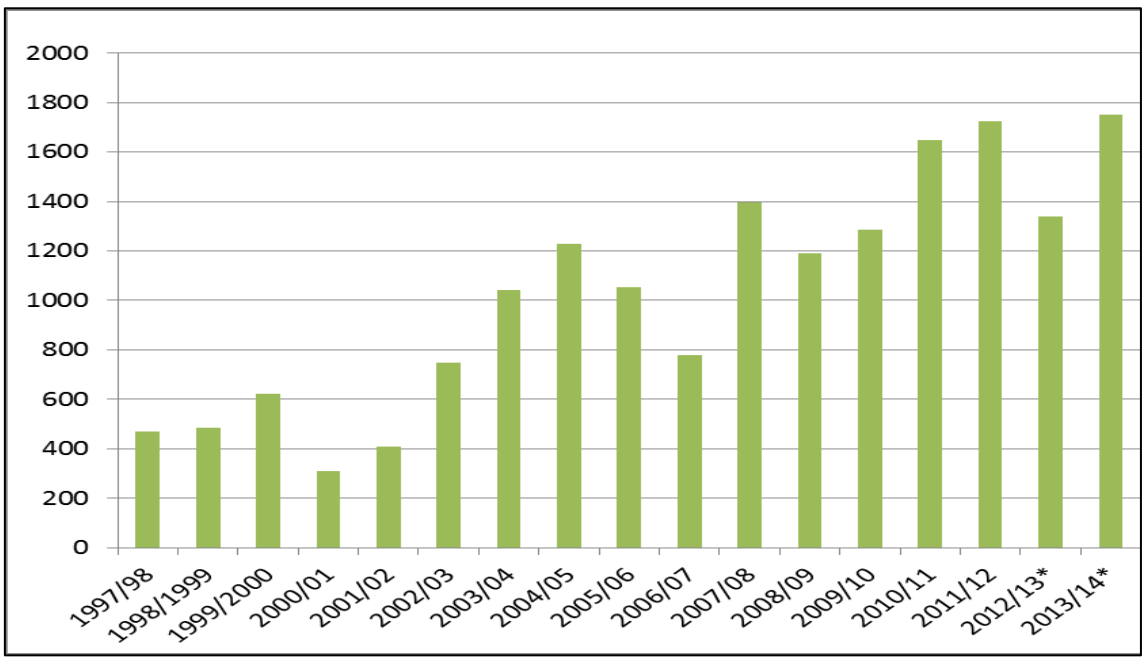

Figure 3-5 Wheat imports (1997/98 – 2013/14) (000) (National Crop Estimates Committee, 2013)

The projected amount of wheat to be imported into South Africa is expecting to reach close to 1.4 million tons of wheat for 2012/2013 (South African Grain Information Service, 2013B), in order to fulfil the local demand of 3.5 million tons (Index Mundi, 2013). The South African Grain Information Service (SAGIS), as can be seen in Figure 3-6, predicts that wheat will mainly be imported from Brazil, Ukraine, Australia, Argentina and Uruguay, accounting for 81% of total wheat imports.

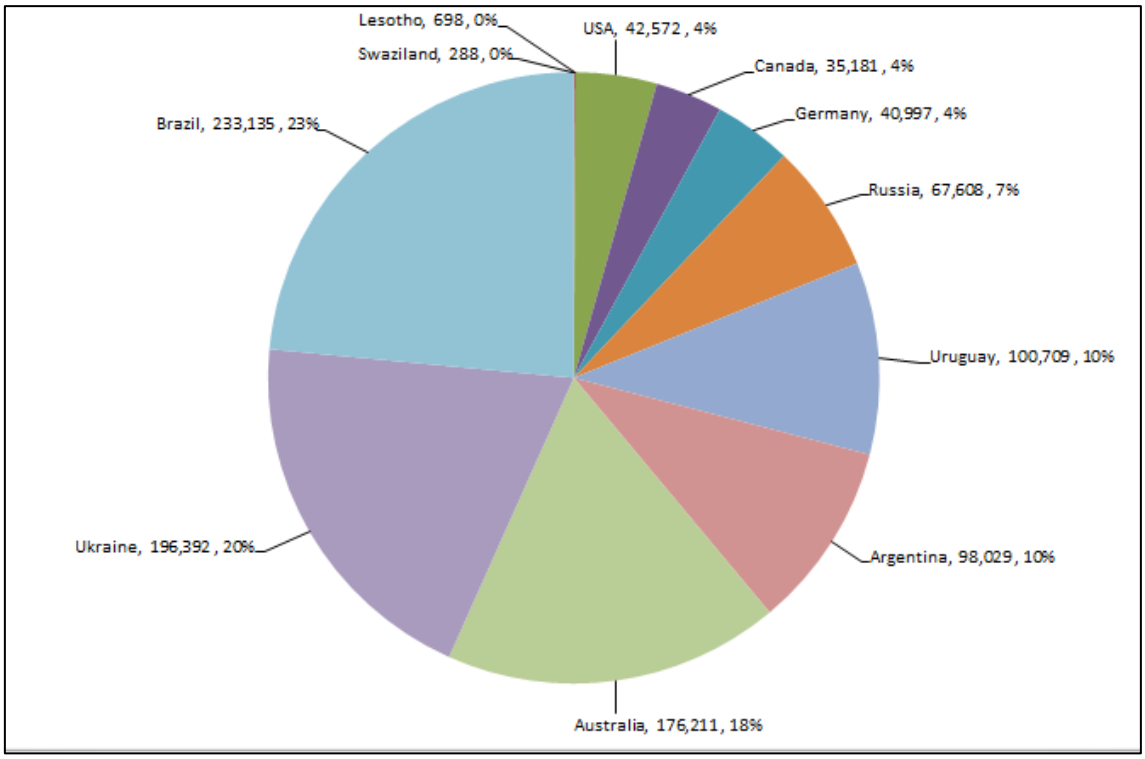

Figure 3-6 Wheat imports 2012/2013 (ton) (South African Grain Information Service, 2013A)

As indicated by Figure 3-7, it is evident that wheat imports from the USA and Argentina have decreased dramatically from previous years (South African Grain Information Service, 2013B). This can be contributed to government restrictions on surplus wheat exports in Argentina (Lima & Gonzalez, 2013) and record high grain prices in the Unites States due to severe draught (Plume & Zabarenko, 2012). Wheat imported from the United States has decreased from just over 600 00 tons of wheat imported in 2011/2012 to a projected 42 572 tons in 2012/2013 (South African Grain Information Service, 2013B).

The competitiveness of domestic wheat is determined by the landed cost of imported wheat. A range of variable forces influences the landed cost of imported wheat, including import tariffs, reference prices (Van der Vyfer & Nordier, 2013), restriction on exports (Orihuale, 2011), international transport costs, weather conditions, exchange rates and government support of exporting countries through the subsidising of local producers (Summer, 2013).

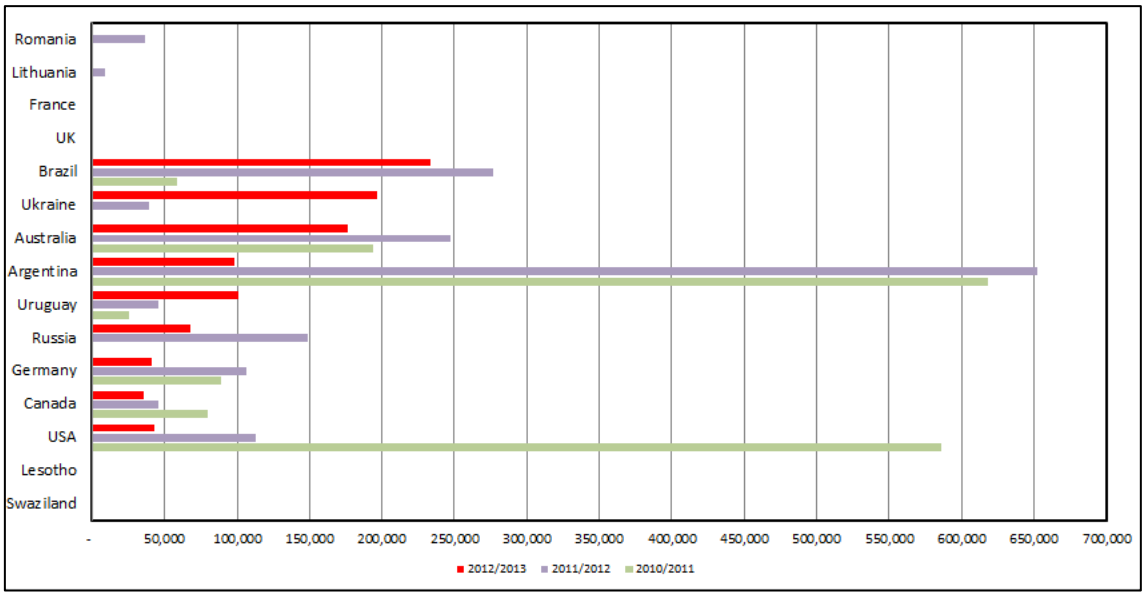

Figure 3-7 South African wheat imports (South African Grain Information Service, 2013B)

Wheat traders will export a projected 219 532 tons of locally and internationally produced wheat to neighbouring African countries in 2012/2013 (South African Grain Information Service, 2013B). The majority of South African wheat is exported into the South African Customs Union (SACU) and the Southern African Development Community (SADC) regions, as can be seen in Figure 3-8. (Department of Agriculture, Forestry and Fisheries, 2005)

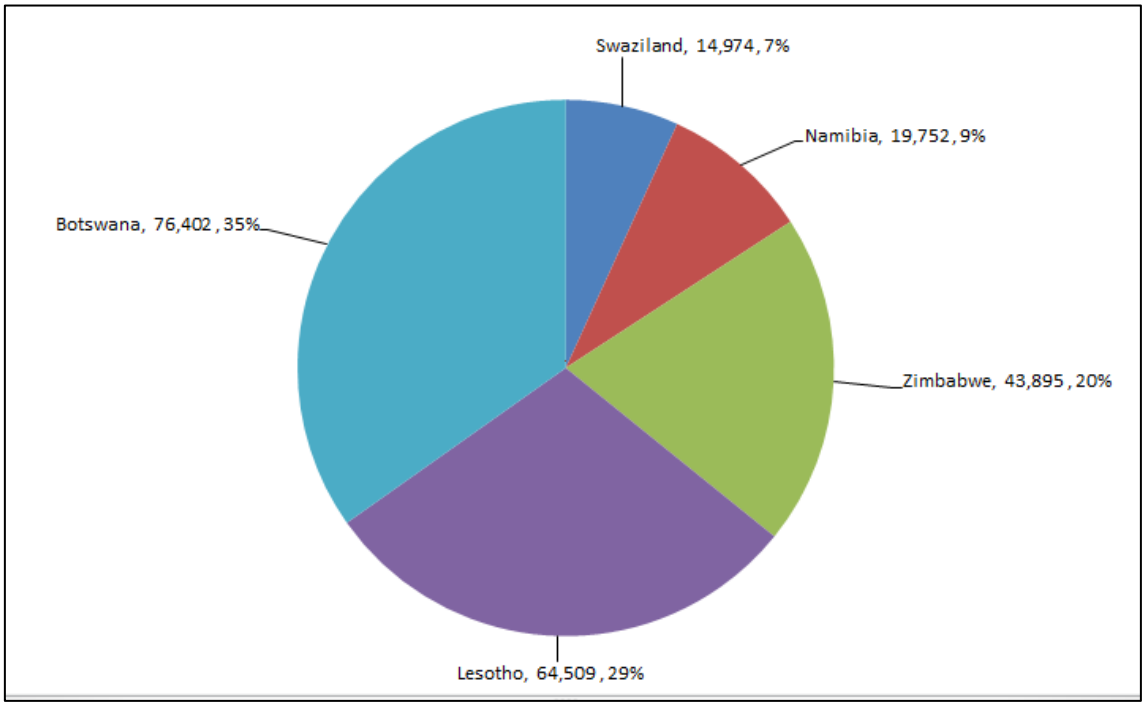

Figure 3-8 Wheat exports 2012/2013 (ton) (South African Grain Information Service, 2013A)

The average yield level of South Africa has improved from around 1.2 tons/ha in 1990 to the current 3.7 tons/ha levels, as can be seen in Figure 3-9. This is a massive 208% growth in yields over a period of 20 years (Van der Vyfer & Nordier, 2013). Compared to other major wheat producing countries, South Africa's average yield level is similar to Canada, United States and Argentina, as can be seen in Table 3:6.

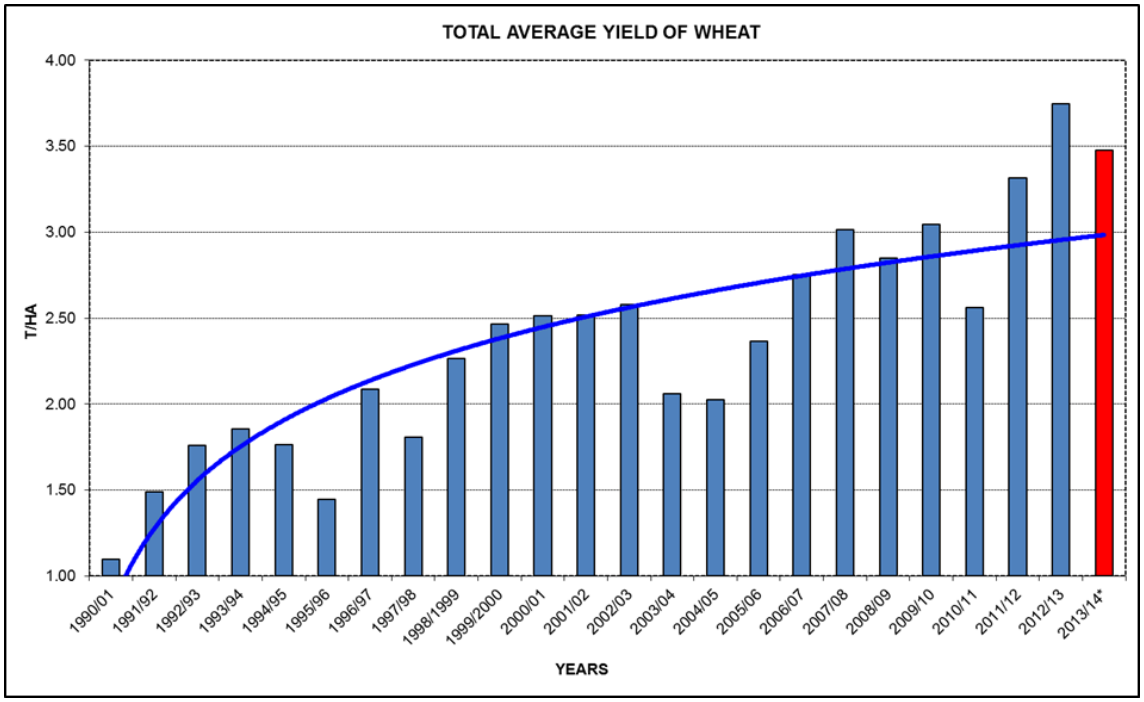

Figure 3-9 Average yields of wheat (Bureau for food and agriculture policy, 2005)

Table 3:6 Average yield per country (1999/2000 – 2003/04) (Bureau for food and agriculture policy, 2005)

International							
	Argentina	**Australia**	**Canada**	**Germany**	**UK**	**US**	**SA**
Average	2.41	1.78	2.22	7.35	7.85	2.74	2.64
Range	2.12-2.66	0.91-2.11	1.84-2.6	6.49-7.88	7.08-8.2	2.36-2.97	1.68-2.84

The improvement in yields can be attributed to an increase in production efficiency. Yield levels have improved due to development in fertilisers and other plant protection chemicals as well as farming machinery (Metho, 1999). Farmers have also been able to increase production knowledge through support from intermediate service providers, such as chemical companies (Nsanganira & Bancie, 2013)

Wheat yields differ between wheat producing regions in South Africa. This is due to different rainfall patterns and land characteristics. The cultivation and preparation of land greatly influence output per hectare. To achieve a desired yield level, the variable input cost of wheat production will vary between regions which will determine the competitiveness of local farmers (Middelberg, 2013).

With South Africa's current yield level estimated at 3.75 tons of wheat per hectare, South Africa would be able to produce an excess of 5 million tons of wheat if the same area of wheat were to have been planted in 1990/91. This would be sufficient to supply the demand of the South African milling industry, while also being able to export surplus production.

3.1.4 Section Summary

This section presented a complete overview of the South African wheat market.

The geographical position of wheat producers in the supply chain, as well as the role of intermediate service providers, organizations and industries involved in the wheat value chain has been identified. This comprised the complete wheat to bread value chain, with discussions on the wheat producers, storage industry, agricultural marketing companies, milling industry as well as the baking industry.

The identification of current trends in the wheat market was undertaken. It concluded that there was a decrease in hectares planted with wheat and an increase in the importation of international wheat to compliment domestic production. However, it was established that the production efficiency in South Africa has improved over the past two decades.

3.2 Agricultural Marketing Companies

3.2.1 Introduction

The deregulation and liberalization of South Africa's agricultural sector has brought with it many challenges and opportunities. These challenges and opportunities range from market development, global and domestic market assessment, new value chains to international trade issues and more importantly, logistical issues (Aginfo Trading, 2013). Agri-business has also become exposed to international market trends, which has required new institutions and relationships, causing a transition from agricultural co-operatives to multi-function agricultural companies (Doyer, et al., 1997).

Changes which have affected agriculture marketing include the closure of the Wheat Board, a conversion from quantitative trade restrictions to tariffs and gradual reductions in the tariffs themselves. (OECD Review of Agricultural Policies, 2006).

The importance of agricultural marketing companies in the wheat industry has grown significantly over the past two decades. Agricultural marketing companies are multi-function organisations in the wheat industry, and will also be referred to as agri-businesses, agricultural traders or agents. Although some agricultural marketing companies provide only a limited range of services, the majority of major agri-businesses in South Africa share a similar operational structure.

In this section the investigation of the operational activities of agricultural marketing companies to identify their influence on the competiveness of the South African wheat industry was undertaken. Agricultural marketing companies such as BKB Grainco, Uni Grain and Bester Feed and Grain, can be used as benchmarks when referring to agricultural marketing companies.

This section addresses research objective 3 (refer to Section 1.3).

3.2.2 Agricultural Marketing Activities

In order to bridge the gap between producers and processors more efficiently, agricultural marketing companies offer both marketing and logistical services towards wheat producers. Traders may offer a complete logistical service that includes local and cross-border transport, clearing and forwarding, warehousing, and delivery to clients' premises when dealing with international and domestic wheat (Bester Feed & Grain, 2013B).

Besides the aforementioned services, agricultural marketing companies may also provide services that include grain quality insurance, stock management, administration systems, the issuing of stock certificates and silo certificates and insurance.

The following sub-sections discuss the most common activities of agricultural marketing companies in South Africa.

3.2.2.1 Trading

Agricultural marketing companies can act as merchants dealing with South African as well as international wheat. Their main focus is to manage the supply of wheat from the producer to the processor through a marketing infrastructure. Agricultural marketing companies may

either buy local or international produced wheat directly from farmers or commodity derivative markets in order to be sold to the milling industry.

While most agricultural co-operatives revert from trading on SAFEX (Bureau for food and agriculture policy, 2005), many agri-businesses have established themselves as a platform for trading wheat in the open market, while providing insight and support towards clients (Bester Feed & Grain, 2013A).

3.2.2.1.1 The Future Exchange

Agricultural marketing companies may use a commodity derivatives market to buy and sell wheat. The trading of wheat includes the buying and selling of both imported and locally produced wheat offered as future contracts. Future contracts are well-specified agreements between buyers and sellers which stipulate the delivery of a carefully described good (quantity and quality) at a predetermined time and price. Besides specifying the quantity, quality, price and delivery period, the contract also stipulates an expiration month, delivery terms, delivery differential, minimum price fluctuation, daily price limits and trading days (National Agricultural Marketing Council, 2009B). Delivery differentials are important when calculating the cost of wheat transport in South Africa, and will be discussed in detail in Chapter 5.

The trading of wheat future contracts in South Africa is facilitated by SAFEX. SAFEX is a commodity derivatives market that forms part of the Johannesburg Stock Exchange (JSE) (SAFEX Agricultural Trading, 2013). SAFEX not only facilitates the trading of future contracts, but also acts as a market price determination mechanism and a risk management facility (Agricultural Products Division, 2005). In a deregulated market where the price of a commodity can be subject to unscrupulous pricing behaviour, a derivatives market is required to send out pricing signals to participants in the wheat market. (National Agricultural Marketing Council, 2009B). This price is determined by the interpretation of the information available to the market, which includes the following (National Agricultural Marketing Council, 2009A):

- the domestic supply and demand situation;
- the international supply and demand situation and international prices;
- the exchange rate.

Wheat producers can however choose to sell their wheat through the spot market. In the spot market buyers and sellers agree on a price for the immediate exchange of the products. This means wheat is delivered to the buyer as soon as the wheat has been purchased. Once the

price is paid, the wheat will be transported from the storage facility to the place where it will be used (Chapman & Hodges, 2011).

The wheat marketing season in South Africa commences on 1 October and ends on 30 September the following year (Department of Agriculture, Forestry and Fisheries, 2010B).

3.2.2.1.2 Derivative Trading

In response to a huge growth in demand, coupled with extreme weather patterns, volatile currency markets and a growing demand for renewable energy sources, agricultural market speculators have increased in South Africa (Bester Feed & Grain, 2013A). In order to trade wheat on SAFEX, participants may use trading platforms offered by agricultural trading companies.

Agricultural marketing companies are offering clients a derivative trading service where account holders are provided with sensible and effective hedging strategies by experienced derivative traders (Bester Feed & Grain, 2013A). Agricultural traders most commonly focus on commodities traded on the SAFEX Agricultural Commodities Division and SAFEX Global Commodities Division, which include wheat.

3.2.2.2 Storage and handling

Agricultural marketing companies can provide storage and handling services for producer clients. Although the majority of grain storage facilities in South Africa belong to agricultural co-operatives, some of these companies have been converted into agri-businesses (Department of Agriculture, Forestry and Fisheries, 2003A). Storage and handling services can also be delivered through partnerships between wheat organisations in the supply chain. This includes producers, agricultural co-operatives, grain merchants, processors and other role players in the supply chain.

Agricultural marketing companies tend to specialize in establishing alternative ways of storage to improve efficiency. By decreasing their dependence on storage infrastructure provided by traditional agricultural co-operatives, agricultural marketing companies are able to obtain more flexibility. This flexibility enables agricultural marketing companies to provide the following services and advantages for clients (BKB Grainco, 2013A):

- No geographical boundaries
- Grading services
- Weighing services

- Competitive storage costs
- Storage of all grain types
- Identity preservation services and segregation of commodities
- Flexibility in receiving any type and quantity of grain.

3.2.2.3 Transport

The deregulation of road transport, implemented by the promulgation of the Transport Deregulation Act (Act 80 of 1988) (Cronin, 2007), along with the deterioration of South Africa's rail network (Department: Performance Monitoring and Evaluation, 2012), have increased the demand for road transport in the wheat industry. Agricultural marketing companies have been able to incorporate transport in the operational structure of their organisations by using a network of transport service providers or by establishing an independent transport division in the trading organisation.

With hundreds of thousands of tons of wheat being transported, agricultural marketing companies have found that smaller transportation contractors, those possessing one to three trucks, do not have the necessary infrastructure needed to support large contracts (BKB Logistics, 2013). Agricultural marketing companies therefore make use of a network of value added transport providers to transport large volumes of grain. By grouping smaller transportation contractors together, agricultural marketing companies can strengthen their ability to negotiate larger transport contracts, while simultaneously giving smaller transport contractors the opportunity to gain access to the larger volumes of wheat transport contracts on offer by agricultural marketing companies (BKB Logistics, 2013).

Agricultural marketing companies, equipped to handle the large volumes of wheat transport contracts, can transport wheat independently, without the assistance of additional transport contractors. Agricultural marketing companies can either establish a logistical division in the current operational structure of the organisation, or they may operate a transport division as an independent profit generating entity.

3.2.3 Section Summary

This section described the workings of agricultural marketing companies and the services they provide to the producers. It also explained their interest in doing so, and what effect that has on the wheat market.

It established that producers' demands cost efficient logistical and marketing services during the post-harvest phase. It further established that the combination of functions fulfilled by agricultural marketing companies have increased the demand for agri-businesses in South Africa. This has led to a decrease of jointly owned agricultural co-operatives in South Africa.

3.3 Post-Harvest Wheat Handling Activities

3.3.1 Introduction

The supply chain of wheat is bound by numerous stages of wheat handling activities. The majority of logistical activities in the value chain are categorized as post-harvest wheat handling activities. Wheat handling is a major expense for wheat producers in South Africa. Wheat in South Africa is delivered based on the SAFEX market price including the cost of wheat handling (National Agricultural Marketing Council, 2009A). Post-harvest wheat handling activities comprise the following (Department of Agriculture, Forestry and Fisheries, 2010B):

- Sorting
- Grading
- Packing
- Marketing
- Storage
- Transport

The majority of the logistical functions in the supply chain of wheat in South Africa are governed by Grain Handling Organisation of Southern Africa (GOSA). The objective of this organisation is to create an environment in which the aforementioned functions can fulfil their roles effectively.

The investigation of the nature and elements of post-harvest wheat handling activities in the supply chain of wheat were undertaken. This will provide insight into the construction of handling costs in South Africa in order to determine the influence of wheat handling activities on the returns of wheat producers in South Africa.

This section addresses research objective 4 (refer to Section 1.3).

3.3.2 Sorting

In order for wheat to be graded and delivered to the milling industry, it needs to be inspected to ensure that all seeds of wheat are free from toxins, chemicals and other substances that render it unsuitable for commercial purposes (Department of Agriculture, Forestry and Fisheries, 2010B). Sorting is done while wheat is in storage, waiting to be shipped to the market, after the harvesting process has been completed. Wheat is inspected to ensure that all seeds are free of organisms and toxins, as determined in terms of the Agricultural Pests Act (Act 36 of 1983), as well as that it contains no more noxious seeds or ergot sclerotic than permitted in terms of the Foodstuffs, Cosmetics and Disinfectants Act (Act 54 of 1972) (Department of Agriculture, Forestry and Fisheries, 2003B)

Wheat sorting also insures that all seeds are free of any odour, taste or colour not typical of undamaged and sound wheat (Department of Agriculture, Forestry and Fisheries, 2010A). With the exception of "Class Other" Wheat, seeds should also be free of insects as well as stinking smut infection (Department of Agriculture, Forestry and Fisheries, 2010B).

The moisture content of wheat is also a critical factor during sorting. Although a moisture content of 25% is not uncommon for newly harvested wheat, it must be dried to 14% in order to be stored for a period of 2 to 3 months. If wheat has to be stored for a period between 4 to 12 months, the moisture content should not exceed 13% (Borlaug & Anderson, 1982).

3.3.3 Grading

Grading is used to distinguish between different classes of production outputs in the South African supply chain. The price for which wheat is sold to the milling industry is determined by the class of wheat based on the protein content (Louw , et al., 2010). Like many grain producing and exporting countries, South Africa's grading system strongly relies on hectolitre mass (HLM) as a guide to grain quality (Engelbrecht, 2008). The HML, and especially the protein content, of wheat are largely determined by the environment during the grain-filling period to maturity, and by producers' practices, which include soil, water and fertiliser management (Department of Agriculture, Forestry and Fisheries, 2003B)

For each class of wheat, different standards are used for each grade. As an example of wheat grading, we shall use class bread wheat, as can be seen in Table 3:7. Bread wheat is known as class B, thus the letter B appears before the grade. Class bread wheat has four grades, namely:

B1, B2, B3 and B4, which are determined according to their protein content and HML (Department of Agriculture, Forestry and Fisheries, 2010B).

Table 3:7 Grading regulations—schematic presentation of classes and grades of bread wheat (Department of Agriculture, Forestry and Fisheries, 2010A)

Bread wheat: Class B			
Grade	Minimum protein (12% moisture basis)	Minimum hectoliter mass (kg/ha)	Minimum falling number (seconds)
B1	12	77	220
B2	11	76	220
B3	10	74	220
B4	9	72	200
Utility	8	70	150
Class other	Do not comply to above-mentioned or any other grading regulations		

The devices used for measurement consist of either a funnel or a cylindrical device (chondrometre) with a measuring cylinder of known volume underneath which is filled with grain in a controlled manner, by an operator (Emvula, 2012). After the moisture content and HML of the wheat is determined, wheat with different levels of protein and HML can be combined in order to achieve a desired grade of wheat (Engelbrecht, 2008). Wheat with low protein content can therefore increase in grade by being combined with wheat with high protein content. For example, the small differences between the two grades for tests weight and protein content make it possible to upgrade grade 2 wheat to grade 1.

Wheat is combined due to the increase in price for a higher grade. The price differential for different wheat grades is not determined by the open market, but by a committee of representatives of SAFEX, the Chamber of Milling, the grain industry, and Grain South Africa (Bureau for food and agriculture policy, 2005)

An issue among farmers in South Africa is the fact that low quality wheat is frequently imported to be blended with high quality South African wheat. Farmers complain that the importation of cheap subsidised wheat of inferior quality lowers the demand for domestically produced wheat which is subjected to strict grading standards (Venter, 2005). Another issue is the fact that the low grading standards for the other class of wheat, which should be graded as feed wheat, opens a back door for importers to import almost any wheat of inferior quality into the country and by doing so, bypass the quality and grading standards set for local wheat (Bureau for food and agriculture policy, 2005).

3.3.4 Packing

Before wheat is shipped to the mills, it is packed in different containers according to its class. Every container and the accompanying sale documents of a consignment of wheat is marked or endorsed by means of appropriate symbols specified by regulations (Department of Agriculture, Forestry and Fisheries, 2003B). These include the following:

1) The class of the wheat.
2) The grade, in the case of Class Bread Wheat, Class Biscuit Wheat and Class Durum Wheat.
3) Symbols referred to in the regulation which will indicate (Department of Agriculture, Forestry and Fisheries, 2010A):
    a) Class:
        - B in the case of Class Bread Wheat
        - C in the case of Class Biscuit Wheat
        - D in the case of Class Durum Wheat
        - O in the case of Class Other Wheat
    b) Grades:
        - S in the case of Super Grade
        - 1 in the case of Grade 1
        - 2 in the case of Grade 2
        - 3 in the case of Grade 3
        - 4 in the case of Grade 4
        - UT in the case of Utility Grade

3.3.5 Storage

Wheat storage is a fundamental component of the wheat supply chain in South Africa. The need for storing grain is self-evident. The annual harvesting season stretches over two to four months, the process of turning agricultural products into consumer products such as bread flour, beer, breakfast cereal, snacks and balanced animal feed, however, takes place on a continual basis. Consequently, agricultural products are stored for periods ranging from a few weeks to a full year, until processing is required (Viljoen, 2012).

The need for storage arises also as a result of changeable weather conditions. During good production years, wheat surpluses need to be stored for longer than a year to create buffer

supplies for bad production years. Wheat surpluses also need to be stored in order to be transported to areas experiencing shortages during a production year.

The methods used for storing wheat have continuously been developed and adapted towards structural changes in the supply chain of wheat in South Africa. With wheat being delivered to centralized storage facilities, situated away from farms, the procedure of wheat storage has become a complex and costly operation (Borlaug & Anderson, 1982).

3.3.6 Transport

Agricultural transport is the dynamic link between producers and consumers. The wheat supply chain is transport intensive from the post-harvest season to the final user (National Agricultural Marketing Council, 2009C). South Africa's agricultural transportation system consists of a complete multimodal system combining rail and road transport (Department of Agriculture, Forestry and Fisheries, 2010B).

The transportation of wheat differs greatly from that of other commodities, in terms of physical characteristics, handling requirements and durability. The volumes, distance, availability of the farmer's own transport, choice of silo and access to outsourcing are some of the factors that determine the type and size of transport used (National Agricultural Marketing Council, 2009C).

The cost of wheat transport in South Africa is calculated by a location differential system. Differentials are annually announced by SAFEX. Location differentials are applied to registered silos across South Africa. Refer to Annexure A for the 2012/2013 location differentials (SAFEX Agricultural Trading, 2013).

3.3.7 Section Summary

This section confirmed and expanded on the post-harvest wheat handling activities comprising of the following:

- Handling
- Storage
- Marketing
- Financing
- Distribution
- Processing

- Related industries

It found that although post-harvest wheat handling refers to a number of activities, marketing, transport and storage provide the biggest challenges for producers in South Africa. In terms of logistical functions, wheat production in South Africa is largely influenced by the cost of wheat transport and storage. In order to calculate the contributing role of these activities in the decline of wheat production in South Africa, the analysis of wheat transport and storage were undertaken in Chapter 5 and 6 respectively.

CHAPTER 4

QUALITATIVE RESEARCH FINDINGS

4.1 Introduction

The findings of this research are reflected in this chapter and stem from the qualitative research methodology as described in Chapter 2. Interviews to be conducted will provide a unique insight into the dominant factors which influence wheat production in South Africa. The findings outlined in this chapter will further be analyzed in Chapters 5, 6, 7 and 8. The aim of this chapter is not to explain the findings but rather to converge the findings until theoretical saturation is reached and to allow for further analysis.

This thesis contains 10 interviews; these included 7 wheat producers, one former wheat producer and agricultural transport service provider, one expert interview with a wheat logistical service provider and one expert interview with an agricultural trader specializing in the trading of wheat future contracts. The interviews covered the dominant factors which influence the wheat market of South Africa. The interviews were conducted using a set of semi-structured questions that acted as a guide and were based on the literature review.

This chapter addresses research objective 5 (refer to Section 1.3).

4.2 Theoretical Saturation

Theoretical saturation refers to the emergence of themes within interviews and also serves as validation of certain standpoints.

The responses from the interviewees were classified into sections based on themes identified in the literature review and new themes identified in the interview process. Themes were then classified in Table 4.1 based on the frequency they were raised during the interview process.

Table 4:1: Frequency of themes raised during interview process

Factor	Frequency
Market price	
Subsidized wheat imports	6
Import Tariffs	5
Government Support	
Rural Development	6
Managing the wheat reserves	3
Infrastructure Development	7
Transport	
Location differential system	8
Shift from rail to road	7
Storage	
New storage development	6

The following sections in this chapter will provide a further in-depth look at the data obtained that allowed for the compilation of Table 4:1.

4.3 Market Price of Wheat

Producers are encouraged to increase production during favourable market conditions. A commodity derivatives market is used to calculate the market price of wheat in South Africa based on the value of future contracts trading on the SAFEX Commodity Derivatives Market. Participants indicated that the market price of wheat in South Africa encourages production.

Wheat producer 1 says: *"A high market price enables us to achieve greater profits which not only encourage us to increase the amount of hectares being planted in the current marketing year, but also in the next marketing year"* (Wheat producer 1, 2013). Wheat producer 4 confirms that production in South Africa is subject to the market price offered towards local wheat producers: *"Production is fuelled by the potential for greater profit"* (Wheat producer 4, 2013).

The market price of wheat in South Africa is subject to variable forces, which can lead to volatility in the market. Wheat producer 2 explains that during erratic market behaviour, producers can limit their risk through the use of future contracts. *"Agreements can be reached with a buyer which will guarantee a fixed price at a predetermined delivery date in the future"* (Wheat producer 2, 2013). Future contracts enable producers to hedge their price risk, thereby limiting their exposure to adverse price movements.

Wheat producers able to foresee changes in the market price of wheat in South Africa can speculate during volatile markets. *"If you are able to foresee a rise in the market price of wheat in South Africa, you can withhold your wheat in storage in order to sell in more favourable market conditions"* says wheat producer 3 (Wheat producer 3, 2013).

4.3.1 Subsidized wheat imports and Import tariffs

The deregulation of the wheat industry allows the importation of wheat from international markets. The market price of wheat in South Africa can be freely determined in the open market based on the supply and demand for both domestic and imported wheat.

The landed cost of imported wheat greatly influences the demand for locally produced wheat. *"We must compete against the market price of international wheat markets, including Russia, Germany and Canada,"* says wheat producer 4 (Wheat producer 4, 2013). The commodity trader confirms that global wheat supplies have a direct impact on the market price of wheat in South Africa. "*Farmers in South Africa must compete against major wheat producing countries who export their surplus stock"* (Commodity Trader, 2013).

South Africa currently imports wheat from developed countries, including Germany, United States and Canada, who implement extensive wheat subsidizing programmes. Government subsidies are used to increase the competitiveness of local exporting wheat markets by providing financial support to local farmers.

Producers in South Africa argue that they are being pushed out of the market due to the competitiveness of international wheat resulting from government subsidies. Wheat producer 1 says: *"Cheap subsidized wheat of inferior quality is being imported into South Africa which decreases the demand for locally produced wheat"* (Wheat producer 1, 2013).

Wheat producers in South Africa can however be protected from cheap imports through trading restrictions. Import tariffs are used to increase the cost of imports, while simultaneously generating tax revenue. "*The South African government however, is avoiding the imposition of high import tariffs, in order to maintain a lower food price index"* says the commodity trader (Commodity Trader, 2013). The current tariff dispensation system in South Africa triggers import tariffs according to a world reference price. This means tariffs are only imposed once the world reference price reaches a specific level.

Producers in South Africa argue that the current wheat tariff dispensation system does not provide sufficient protection against cheap imports. Wheat producer 3 says: *"Wheat producers*

in South Africa are left relatively unprotected from global forces" (Wheat producer 3, 2013). "*Farmers feel that the world reference price of wheat is currently too low to provide proper protection*" says wheat producer 5 (Wheat producer 5, 2013).

A former wheat producer confirms that in order to stimulate wheat production in South Africa, producers need to receive additional support from the government (Former wheat producer and agricultural transporter, 2013). The commodity trader, however, indicates that any form of government intervention will increase the market price of wheat, a scenario which the South African government wants to ignore at all costs (Commodity Trader, 2013).

4.4 Government support

The South African government is responsible for the development and sustainability of the wheat production industry of South Africa. Besides maintaining agricultural infrastructure, protecting the local wheat market and managing South Africa's grain reserves, the government is also responsibility for rural growth and development.

The Department of Rural Development and Land Reform (DRDLR) aims to rectify the imbalance in South African agriculture sector by transferring agricultural land to black emerging farmers through the land distribution programme. The government is trying to help small farmers establish themselves and contribute to the country's food supply.

Participants have indicated that rural development in South Africa is not commercially sufficient. Wheat producer 1 says: *"The government is investing large sums of money into the development of small scale farmers who cannot compete on a commercial scale"* (Wheat producer 1, 2013). *"Emerging farmers do not have the necessary skill and experience to produce wheat efficiently"*, says wheat producer 7 (Wheat producer 7, 2013).

The current trend is that large farms are increasingly being extended to achieve economies of scale, because medium sized farmers often struggle to cope effectively. There is therefore a strong sense that the South African government should use its limited resources to improve the rural infrastructure required for commercial agriculture, rather than to invest in inefficient farming practices which decrease the overall competiveness of South Africa's agriculture sector.

4.5 Transport

Producers are liable for the cost of wheat transport required to facilitate distribution in the wheat value chain of South Africa. Former wheat producer says: *"The costs of transporting wheat from storage to the milling industry influence the revenue of wheat farmers in South Africa*" (Former wheat producer and agricultural transporter, 2013).

"Producers are unable to manage the cost of wheat transport, which is influenced heavily by the efficiency and availability of transport infrastructure" says wheat producer 5 (Wheat producer 5, 2013). Transport costs in South Africa are automatically subtracted from the market price received by the producer.

4.5.1 Location Differential System

The cost of transporting wheat in South Africa from storage to the market (milling industry) is determined by a location differential system when dealing with SAFEX future contacts. Each grain-producing area in South Africa has a location differential based on the cost of transporting wheat to a reference delivery point.

Farmers in the Western Cape and Northern Cape, based the furthest from the reference delivery point of Randfontein, have been the biggest critics of the location differential system. Wheat producer 2 says: "*It is unfair that we should pay the cost of transporting wheat to a distant market; where in reality our wheat is consumed at mills nearby"* (Wheat producer 2, 2013). All transport differentials are calculated as if wheat is being transported to Randfontein.

Differentials are based on the actual cost of transporting wheat to Randfontein using existing infrastructure. Transport differentials are annually published by SAFEX. Calls from within the grain value-chain are being made to do away completely with the differential system. "*Wheat producers are struggling under high transport costs and low market prices"* says wheat producer 3 (Wheat producer 3, 2013). The location differential system, however, cannot be blamed for high transport costs. *"It is the responsibility of the government to provide a sound infrastructure, capable of delivering efficient transport* "says wheat producer 6 (Wheat producer 6, 2013).

4.5.2 Shift from Rail to Road

The unavailability of agricultural rail infrastructure in South Africa, connecting centralized storage facilities to major transporting networks, is forcing the wheat industry to make use of

alternative transport systems. *"The mismanagement of rail infrastructure in South Africa is forcing us to make use of road transport, a mode far more expensive than rail"*, says wheat producer 2 (Wheat producer 2, 2013).

Former wheat producer and agriculture transport provider, has confirmed that road transport is expensive due to variable risk factors. *"The cost and efficiency of road transport is influenced by deteriorated roads, the price of diesel and untrustworthy drivers."* He further elaborated by stating: *"Deteriorated roads lead to a considerable increase in the maintenance cost of trucks', especially in terms of tyre replacement"* (Former wheat producer and agricultural transporter, 2013).

According to the logistics manager of an agricultural marketing company, the use of deteriorated roads can however be avoided by using alternative routes. "*The additional transport costs when using alternative routes, if possible, can be estimated between 5–10%"* (Logistics Manager, 2012).

The efficiency of agricultural transport relies heavily on the investment, maintenance and rehabilitation of transport infrastructure. *"In order to decrease the cost of wheat transport in South Africa, the South African government will have to upgrade its current rail transport system"* says the logistics manger (Logistics Manager, 2012). This will decrease the use of road transport, which will release the pressure being put on South Africa's primary and secondary road network.

4.6 Development in Wheat Storage

Producers are responsible for the cost of wheat storage. A common theme identified during interviews is that opportunities are being provided for by new developments in wheat storage. Six respondents consider current storage as a means of increasing the efficiency of wheat handling.

"Agricultural marketing companies are actively involved in the development of alternative storage, able to improve the efficiency and competiveness of local wheat farmers" says the logistics manager (Logistics Manager, 2012).

Wheat producer 2 has acknowledged the flexibility of an on-farm storage system. "*By using an on-farm storage system, it eliminates the need for me to transport wheat to a centralized storage facility during the harvesting process"* (Wheat producer 2, 2013).

Wheat producer 3 has however indicated that although flexible storage systems, such as silo bags, can increase the overall efficiency of wheat delivery in South Africa, it will not compensate for the inefficiency of agricultural transport services (Wheat producer 3, 2013).

4.7 Chapter Summary

This chapter concluded all the information gathered through the interviews undertaken based on the qualitative research approach. It summarized the frequency of themes emerging from the interviews.

Interviews conducted have provided a unique insight into the dominant factors which influence wheat production in South Africa. It established that the foremost influences on the wheat market is the cost and method of storage, the transportation expenditure, the economic force of the international market and role of the South African government.

The findings outlined in this chapter will further be analyzed in Chapters 5, 6, 7 and 8.

CHAPTER 5

WHEAT TRANSPORT

5.1 Introduction

It was established in Chapter 4 that the transportation of wheat has a considerable influence on the revenue of the producers. In the following chapter the analysis of the transportation of wheat, in the context of wheat producers by referring to the three different transport modes used in the supply chain of wheat in South Africa, was undertaken.

The nature of wheat transport, as with the majority of logistical services, has adapted to changes in the South African wheat industry. The rate of transportation mode usage has become dependent on the availability of transport infrastructure. The demand for more efficient logistical services has also resulted in an increase in the use of professional carriers and other intermediate service providers.

This chapter, together with Chapter 6, addresses the dominant influences on the revenue of the producers (i.e. referring to research objective 6). This chapter will specifically address the location differential system and the shift from rail to road transport as was identified in Chapter 4.

5.2 South African Wheat Transport Modes and Challenges

The transport of wheat in South Africa is a complex system which provides numerous challenges. It is important that in defining transportation costs, drivers are identified and defined in order to estimate their impact on wheat production. The structure of South Africa's agricultural transport system should also be investigated, in order to enable it to meet future production outputs. In the following sections, the analysis of the numerous costs, and the challenges of the transportation modes involved in transporting wheat across the supply chain of South Africa was done.

By referring to Figure 5-1, it can be seen that wheat transportation in South Africa occurs in two stages. Stage one is transporting wheat from the field of the producer to a delivery storage facility, where wheat is temporarily stored. Stage 2 is the bulk transportation of wheat from the storage facility to the milling industry. Wheat can be transported either by rail or road, depending on the efficiency of available infrastructure and transport services.

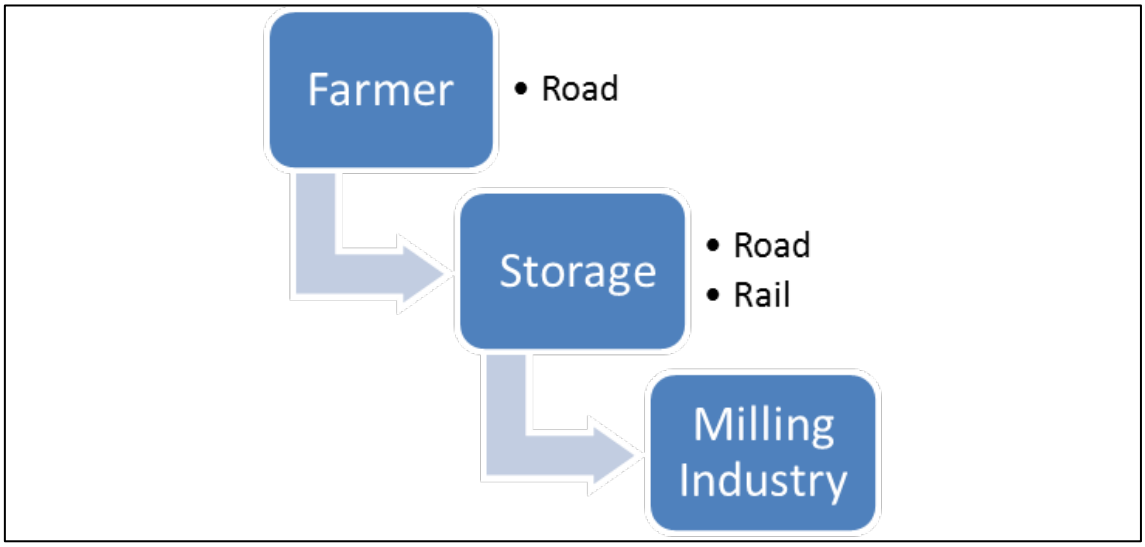

Figure 5-1 Transport Stages

5.2.1 Road Transport

Road transport is the most frequently used transport mode in the supply chain of wheat in South Africa, accounting for over 50% of total wheat transport in South Africa (South African Grain Information Service, 2013A). The lack of efficient rail transport services in South Africa, as will be discussed in the Section 5.2.2, accompanied by the Transport Deregulation Act (Act 80 of 1988) has led to the increase in popularity in road transport. The availability of road transport, combined with its high accessibility makes it the predominant choice across different segments of the chain.

5.2.1.1 Field to Storage

South Africa makes use of a labour intensive system of grain movement. This is to minimize the capital investment of farmers in South Africa, where the cost of labour is relatively lower than the cost of capital (Borlaug & Anderson, 1982). If a farmer's crop is not sold at the time of harvest, he or she will have to transport his or her wheat to a storage facility, usually located at a central point, immediately after being harvested (Field Crop Marketing, 2000). This is in

contrast to countries where the absence of labour forces farmers to store wheat on a temporary basis on their farms, before being transported to centralized storage facilities.

All deliveries from field to grain storage silos are done by using a range of tractor trailer combinations, trucks and articulated vehicle combinations depending on the scale of the farming and the harvesting operation. The amount of loading and unloading from wagons or trucks should be kept to a minimum. The more wheat handled between farms and mills, the greater the risk of losses and costs for farmers (Borlaug & Anderson, 1982).

Figure 5-2 Farmers loading wheat onto trailers during harvesting (DASQ, 2012)

In the past wheat was delivered in bags, which proved to be time consuming for obvious reasons. Farmers have since begun using wheat bins, containers commonly known as “massabakke” or mass bins; which are loaded onto wagons or trailers (Richter, 2009). These “massabakke” are fast and efficient during offloading and provide the advantage of being compatible with a diverse range of vehicles.

Figure 5-3 Examples of "massabakke" used to transport wheat

The transportation cost from field to storage is largely determined by the storage location used by the producer. Due to few return loads, vehicles are not always fully utilized when transporting wheat to storage. With high fuel prices, farmers tend to deliver to the nearest silo. This results in silos being too small to accommodate the entire crop of a region, forcing wheat to be moved soon after arrival, resulting into double handling (National Agricultural Marketing Council, 2009C).

Depending on the scale of production and the distance covered, farmers can either provide their own means of transport or use contracted transport providers. The responsibility of transporting wheat from the field to storage can also be transferred to the buyer. Agricultural marketing companies are increasingly offering producers additional logistical services, as discussed in Chapter 3, which include transporting wheat to regional storage facilities or even directly to the market. This however, requires producers or agricultural marketing companies to provide an on-farm storage system in order to store wheat temporarily during and after harvest. With new development in wheat storage methods, farmers and agricultural marketing companies are increasingly investing in low cost on-farm storage systems, such as silo bags. On-farm storage system simultaneously saves both time and effort for producers during the harvesting process by eliminating traveling time between field and storage facilities.

5.2.1.2 Storage to Mills

The biggest obstacle to transporting wheat in South Africa lies not in the process of transporting wheat from the field to a storage facility, but in transporting wheat from storage to the market. The cost of wheat transport is currently the biggest post-harvest expense for wheat producers in South Africa, determined by the location differential system, which will be discussed in Section 5.3 (Grain SA, 2013C).

South African major road networks, used in transporting wheat to the market, are currently suffering from congestion. This is caused by the unreliability and inconsistency of the railway services offered by Transnet, which forces supply chains to use road transport as an alternative mode. The excessive use of South African roads is damaging the road infrastructure, which leads to costly upgrades. In order for farmers to retain access to markets, the main grain corridor of South Africa urgently needs to be repaired.

Under-investment in South Africa's road network is a major problem, evident in the fact that nearly 80% of the national road network is older than the original twenty – year design life (Kannemeyer, 2011). This is a clear indicator of the huge backlog cost in road maintenance and rehabilitation. Referring to Figure 5-4, the condition of South Africa's major road network can be viewed, ranging from very poor to very good. Notably, the map underestimates the poor condition of South Africa's roads, because it only portrays the condition of the major road networks, which is better maintained than the rest of the paved network and gravel roads (Department: Performance Monitoring and Evaluation, 2012).

Figure 5-4 Condition of major road networks in South Africa (Department: Performance Monitoring and Evaluation, 2012)

New roads and major repairs of existing roads can typically cost about R4.2 million per kilometre for a lightly trafficked paved rural road, while constructing and maintaining heavy freeway structures can cost over R15 million per kilometre (Department: Performance Monitoring and Evaluation, 2012). According to the South African National Roads Agency SOC Limited (SANRAL), the budgeted expenditure on national roads for 2012/2013 was estimated at R12.4 billion with the budgeted expenditure of provincial roads, with include paved and gravel roads, to be over R16 billion. This will be used for maintenance, upgrading and rehabilitation activities for primary and secondary roads in South Africa (The South African National Roads Agency SOC Limited, 2012).

An inadequate or inappropriate road network, or one that is not well maintained, can considerably increase the cost of transporting goods. Road user cost can be twice as high when using roads in poor conditions compared to roads in good conditions. This is caused by the increase in the maintenance costs of transporting carriers, which include the replacement cost of tyres, damaged by potholes. Trucks which operate on questionable roads can suffer increases in maintenance costs of between 684% and 1560% (National Agricultural Marketing Council, 2009C). Damaged roads can also have an effect on the transported freight. According to a study by the University of Pretoria, wheat loss is estimated at 0.62 kg per ton when using deteriorated roads (Bean & Steyn, 2013).

With the increase in the price level of diesel, the cost of road transport is adding additional costs to the price of wheat in South Africa. These costs need to be carried, either by the wheat producer or the wheat purchaser (wheat trader). The deterioration of the infrastructure and the cost of transport are therefore heavily constraining the competitiveness of South Africa's agricultural market.

In order to increase the competitiveness of wheat in South Africa, the transport process needs to be as efficient as possible. With transport regarded as a critical cost driver of wheat production in South Africa, the process of estimating the cost needs to be evaluated, either by the producer or the transport service provider. Transport efficiency is about optimising payload, average speeds and kilometres travelled. With the challenges in transporting agricultural products it is understandable that there is scope for improving transport efficiencies. Small improvements in kilometres travelled, average payload and more return loads can have a dramatic impact on actual costs (National Agricultural Marketing Council, 2009C).

5.2.2 Rail Transport

Rail transport is used in transporting wheat from storage facilities in bulk to the wheat markets in South Africa. This includes transporting domestic and imported wheat from centralized storage facilities based in agricultural regions and commercial ports across South Africa to the milling industry. South Africa's core rail network consists of 13 000 km, of which 8000 km forms South Africa's under-used branch line network, which services agricultural storage facilities (Business Monitor, 2011). Figure 5-5 illustrates South Africa's national railway network with the orange lines representing the core network while the green lines indicate the location of the less frequently used branch line network. Significant features of South Africa's railway network are the following (Department: Performance Monitoring and Evaluation, 2012):

- The core railway network connects South Africa's eight primary sea ports to the hinterland.
- Freight and passenger services share the same tracks, at least on inter-city networks.
- The rail network connects to neighbouring Namibia, Botswana, Mozambique, Zimbabwe and Swaziland.

Figure 5-5 Rail network of South Africa (Department: Performance Monitoring and Evaluation, 2012)

Unfortunately, due to the mismanagement and deterioration of agricultural rail infrastructure in South Africa, branch lines connecting centralized storage facilities to major transporting networks, are not always available. With receiving facilities at silos and mills designed and built to receive by rail, wheat facilities have been forced to adapt to an alternative means of transport.

Transport data released by SAGIS, referring to Figure 5.6, indicates that over the past 7 years the percentage of total wheat transported by rail has slumped from 44% (or 1.6 million tons) in 2006 to 25% (or 1.1 million tons) in 2012. Thus far in the current year, the percentage of wheat transported by rail is 25% (or 0.5 million tons) of total wheat transport. As can be seen, the majority of wheat in South Africa is currently being transported by road, accounting for over 50% of total wheat transport since 2009 (South African Grain Information Service, 2013A).

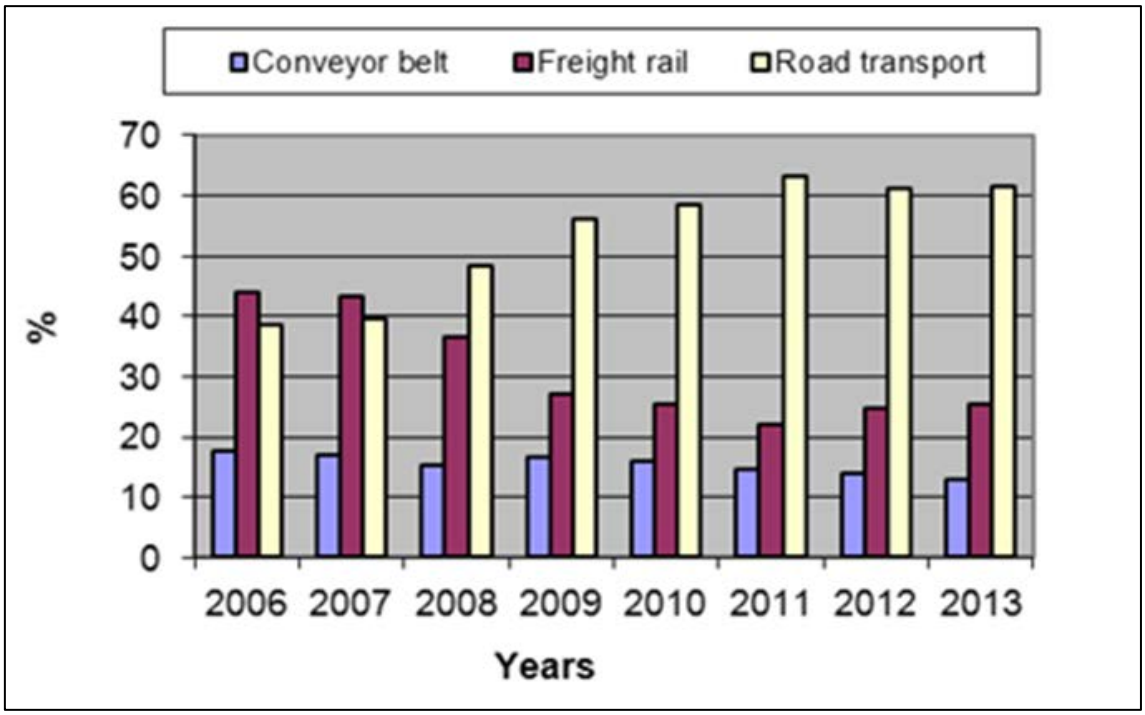

Figure 5-6 Wheat transport by component (South African Grain Information Service, 2013A)

The inefficiency of South Africa's railway system adds substantial costs to the price of basic food products in South Africa. Rail transport provides the enormous challenge of upgrading and maintaining a much needed rail system for the transport of agricultural commodities. The South African rail system is old, on a narrow gauge and uncompetitive in the transport of general freight, which places a massive burden on road freight (Havenga, 2007).

A major problem with agricultural railway systems is that more than 60% of the current rail network carries very little traffic. These lines, however, have to be maintained to the same standard as other lines with denser traffic so that safety will not be compromised. Agricultural railway lines are part of the greater Transnet Freight Rail (TFR) network and are operated under the same cost structure, which includes high overhead costs (National Agricultural Marketing Council, 2009C). The problem, however, is that these railway lines do not generate enough revenue to offset the cost of maintenance and overheads. It is for this reason that the majority of rural network lines have been neglected in the past.

South Africa's national railway management is currently in a process of rationalising the rail network and considering the closure of unprofitable branch lines due to the insignificant volumes being transported by these lines. This will effectively influence the development of South Africa's economy, specifically within the development of subsistence farmers and

commercial farmers, who are often within geographic reach of a branch line (Simpson & Havenga, 2012).

Although branch lines are being neglected, South Africa does have considerable volume opportunities in rural areas. Research has demonstrated the potential of rural branch lines, when considering freight transport externalities, road usage costs and long-term demand. The direct transport costs as well as externality charges for the economy can be reduced significantly if volume is to be captured correctly. This will not only increase the competitiveness of rural communities, but also enable the provision of more sustainable freight transport to agricultural communities. Savings will become even more considerable if pressure is placed upon by the government through regulations and taxes (Simpson & Havenga, 2012).

If available volume is to be captured, an increase in investment will however be required in order to upgrade rural networks lines, to a condition suitable for the agricultural sector. To justify investment and determine the potential for profit, the following questions in agricultural logistics will have to be answered (National Agricultural Marketing Council, 2009C):

1. Which branch lines will be restored and how long will it take to get them working again?
2. Are the branch lines viable? If so, to what extent?
3. If so, how should they be operated and what are the operating costs to be covered?
4. Can sufficient ton/km be generated to justify the investment and cost of operating and maintenance?
5. Can seasonal, relatively low volumes justify the huge investment it will take to rehabilitate and implement these supplementary services?
6. Would branch line rail services haul load either way, or just one way? How many growers, silo and mill operators, etc. would prefer to use road transport to get freight to a core rail system?

Rail reform in South Africa is also anchored in the ‘road versus rail’ debate. Rail transport technology lends itself mainly to the particular requirements of only a relatively small number of industries or commodities, which include the wheat industry. This means that although rail transport can lower the transport cost of bulk goods over long distances, the system does not

lend itself to typical transport requirements of small to medium size enterprises in South Africa. In contrast, the flexibility and accessibility offered by road infrastructure typically facilitates the development of a much wider range of commercial enterprises, and also allows many more locations to engage in economic activity, would never be possible with rail (Department: Performance Monitoring and Evaluation, 2012). This is despite the fact that road transport costs are generally higher than rail transport costs.

The result is that when the efficiency of any infrastructure is measured, a broader view must be taken rather than just the cost of a transport system. Although heavy investment in rail infrastructure can lower the cost of transporting wheat over long distances, the operational efficiency may only benefit a small number of users. Before rail infrastructure is reformed in South Africa, it must be determined whether the benefits to a minority group of producers of "rail friendly" cargos is outweighed by the advantage that other enterprises would have received from a greater investment in road transport.

5.2.3 Ocean Transport

With the deficit in our domestic production of wheat, South Africa needs to import wheat from international producers to supply our local market. South Africa will import an estimated 1.5 million tons of wheat in 2013 from international markets, which will be shipped across oceans by means of bulk carriers, able to accommodate the physical characteristics of the commodity. For wheat to be shipped efficiently, shipments must be transported in bulk quantities to achieve economies of scale. South Africa needs to provide an infrastructure capable of accommodating bulk carriers at ports used to transport wheat.

South Africa has eight main commercial ports namely Saldanha Bay, Cape Town, Mossel Bay, Port Elizabeth, Ngqura, East London, Durban and Richards Bay. All ports are owned by the National Ports Authority (NPA), a division of Transnet. As the national ports planning authority, Transnet divides the ports into three groups: the Western, Central and Eastern ports, as illustrated in Figure 5-8. The divisions are based on the hinterland they serve connected by South Africa's railway network (Transnet, 2007).

Ports function as part of a logistical framework within a commercial and economic environment. Commercial ports consist of a mixture of physical infrastructure and operational services. South Africa's ports provide a wide range of services, focusing almost exclusively on

bulk commodities, with some specializing in one cargo type and others providing facilities for a range of commodities.

Wheat and other agricultural commodities can be facilitated at the ports of Durban, Cape Town and East London. Grain elevators and handling gantries are required to facilitate the throughput of grain. Wheat and wheat products, along with fertilizers and other agricultural commodities are categorised as dry bulk commodities. Referring to table 5.1, a summary of cargo throughput in tonnage can be viewed for dry bulk per above mentioned ports, able to accommodate wheat in South Africa. As can be seen, the geographical position of the port of Durban in regards to the wheat markets of South Africa makes it the most economical distributor of imported wheat in the supply chain.

Figure 5-7 Ports of South Africa by Corridor They Serve (Department: Performance Monitoring and Evaluation, 2012)

Table 5:1 Dry bulk throughput per port (million tons) (Department: Performance Monitoring and Evaluation, 2012)

Port	Commodities	Tonnage
Cape Town	Wheat/wheat products	0.11
	Agricultural products	0.29
	Fertilizer	0.22
	Other dry bulks	0.19
Durban	Wheat/wheat products	1.05
	Other agricultural products	0.78
	Manganese ore	0.73
	Alumina	0.04
	Fertilizer and products thereof	0.73
	Wood chips	0.54
	Coal	1.54
	Other dry bulks	2.27
East London	Wheat/wheat products	0.07
	Other agricultural products	0.03
	Other dry bulk (maize)	0.32

South African port infrastructure faces a range of challenges which constrain the cost of international trade. For South African ports to be efficient there need to be a good level of productivity in terms of ship turnaround time and port tariffs. A benchmark study of port performance criteria and port tariffs from various ports around the world carried out by the South African Ports Regulator found that tariffs in South African ports, compared to the level of performance, tend to be significantly higher than most international ports (National Freight Logistics, 2009). South African port authorities are faced with the challenge of providing efficient wheat unloading facilities as well as increasing handling speed and administrative processes.

In terms of infrastructure, South African ports also need to provide and maintain grain elevators and handling gantries in order to support the expansion of wheat imports. In the past decades, East London's grain terminal, which includes the largest grain storage elevator in the country, has fallen into disuse as overall maize exports have declined. Deterioration in the

condition of the overhead handling gantries has resulted into alternative means of discharging and loading grain. Transnet has however recently announced plans to invest in the upgrading of grain facilities in East London, which include the refurbishment of the grain elevator and handling gantries in order to accommodate the increase in wheat imports (Department: Performance Monitoring and Evaluation, 2012).

5.3 Location Differential System

The cost of wheat transport from storage facilities to the market in South Africa is determined through a location differential system implemented by the Johannesburg Stock Exchange (JSE). As mentioned earlier, future contracts are used as a means of buying and selling wheat in South Africa. SAFEX is a financial markets division of the JSE where future contracts for wheat are exchanged. The price of wheat transport is determined and evaluated through the market value of SAFEX future contracts by the JSE. The JSE annually announces the cost of wheat transport per ton for each region of South Africa through the location differential system (Van Burick & Smith, 2004)

In order to facilitate trade between all market participants, the futures contract must be standardized as to grade, quantity, and location. When SAFEX introduced wheat future contracts, Randfontein was chosen as the reference delivery point, due to its milling capacity and rail links to the rest of South Africa. The use of a reference location in futures market design is internationally well accepted and understood. To increase the attractiveness of the SAFEX wheat futures contracts and to increase the areas that can deliver through the SAFEX contracts, any silo in South Africa can be 'listed,' to become capable of being used to initiate delivery against a SAFEX contract (Bureau for food and agriculture policy, 2005). SAFEX has instituted a location delivery system in the design of the contract. When a holder of a wheat contract declares his intent to deliver against the contract, the amount that the holder receives is adjusted by the location differential. This differential is an estimate of the transportation cost from the delivery silo to Randfontein (Matthew, 2009).

5.3.1 Location Differential Prices

SAFEX wheat prices are Randfontein-based, meaning that when a producer delivers or a miller accepts delivery at Randfontein, he or she will receive or pay the SAFEX price for the delivery month contract (the spot price). Due to delivery taking place at various points across producing regions in South Africa, spot prices are largely based on a SAFEX adjusted price. For example, if

the transport costs between Randfontein and the silo, where a producer chooses to deliver is R250/ton, the delivery price for the producer will be equal to the Randfontein price (contract price) minus the R250/ton transport cost. The buyer will now collect the wheat from the relevant silo at the SAFEX price minus the R250/ton.

Transport cost differentials are calculated annually and are available to producers from SAFEX. Area differentials are based on a weighted average transport cost by road and rail. The areas that make more use of road transport will have a larger road transport cost proportion in the calculation (National Agricultural Marketing Council, 2009B).

5.3.2 Location Differential System Challenges

The use of the location differential system has proven to be controversial among wheat producers in South Africa. Farmers continuously question the fairness of the system and have requested that the system should be reconsidered by Grain South Africa. Farmers in the Western Cape and Northern Cape, based the furthest from the reference delivery point of Randfontein, have been the biggest critics of the differential system. Farmers argue that it is unfair that they should be liable for the cost of transporting wheat to Randfontein, as published by SAFEX, if future contracts do not reach their delivery dates. Only 10% of all physical grain is actually being delivered on SAFEX (Visser, 2010). Producers have asked for the location differential system to be scrapped, and instead exchange trades at a par price, in other words all registered delivery points should be at the same price (National Agricultural Marketing Council, 2009B).

There is, however, a consensus within Grain South Africa, that the location differential system should not be scrapped. Grain South Africa is constantly appointing task teams, consisting of wheat marketing experts, to evaluate the success of the differential system. According to studies, the location differential system has the advantage of increasing transparency among producers and buyers when calculating the value of wheat at point of delivery and consumption (Van Burick & Smith, 2004). It is also argued that the scrapping of the differential system will harm producers, especially those that are based in low differential areas, by reducing their ability to obtain input financing.

Also, if no location differentials are applied, producers selling future contracts, will only be responsible for the cost of loading and storage, and not transport. In this case, buyers of futures contract will not know where delivery would take place and thus would have to calculate a possible transport cost into the price traded on SAFEX. According to the GM of

SAFEX (Mr Rod Gravelet-Blondin), the general experience on international markets is that such a discount would represent 75% of the anticipated delivery cost of the delivery point that is furthest from the market. This would mean SAFEX prices would be much lower than location differentials (National Agricultural Marketing Council, 2009B).

In 2013, the Agricultural Marketing Council and the Competition Commission of South Africa investigated the possibility of scrapping the differential system in the Western Cape for 2014/2015. In December 2013, the JSE, supported by the Financial Service Board, announced that the differential system would not to be scrapped, much to the disappointment of farmers in the Western Cape. In order to improve the efficiency of the location differential system, Grain South Africa has since announced that their focus will now be on the methodology of calculating the transport differentials as well as improving South Africa's railways system (Grain SA, 2013B).

5.4 Chapter Summary

This chapter analysed the transportation of wheat in the context of wheat producers by referring to the three different transport modes used in the supply chain of wheat in South Africa.

It established that the deterioration of South Africa's railway infrastructure is increasing the cost of wheat transport in South Africa. The inefficiency of rail transport in rural areas, where the majority of storage facilities are located, is forcing producers to make use of road transport, acknowledged to be 30% more expensive.

It further established that there is also a level of discomfort among producers over the location differential system used to determine wheat transport costs in South Africa. Wheat producers, especially in the Western Cape, who had the highest production output per province in 2012, argued that it is unfair that they are liable to pay for transporting wheat to Rustenburg, when in reality their wheat is potentially being shipped too much closer markets. Requests to move away from this system however, have been ignored, due to the transparency it provides when

CHAPTER 6

WHEAT STORAGE

6.1 Introduction

Inclusive of the transport expenditure it was further established in Chapter 4 that wheat storage has also a considerable influence on the revenue of the producers.

In this chapter the investigation of the storage systems of wheat at present in South Africa is undertaken, by referring to the strategic importance of wheat storage and current practices being implemented in the supply chain. This will give producers the knowledge and understanding of how the logistical costs of storage are composed and influenced in the current value chain of wheat in South Africa.

This chapter, together with Chapter 5 addresses the dominant influences on the revenue of the producers (i.e. referring to research objective 6). It will specifically address the new storage development in South Africa's wheat industry as was identified as a theme among respondents in Chapter 4 during the interview process.

6.2 Wheat Storage in South Africa

South Africa has good storage facilities with fair competition between storage providers (The Wheat Steering Committee, 2002). According to the Grain Silo Industry, the total grain silo storage capacity in South Africa is estimated at 17.5 million tons, comprising 15.4 million tons belonging to co-operatives and agribusinesses [split between north (14.5 million tons) and south (0.97 million tons)]. The rest belongs to harbours and private owners (National Agricultural Marketing Council, 2009A).

Storage facilities are required to manage the wheat reserve of South Africa and to supply the continuous demand of the milling industry throughout the year. The cost of handling wheat in

South Africa is higher than that of maize. Wheat storage facilities require more sophisticated equipment which increases the cost of storage. Risk and quality also influence the cost of wheat storage in South Africa. Due to different cost structures, the cost of grain storage in South Africa is more expensive in the south than in the north. (National Agricultural Marketing Council, 2009A).

6.2.1 Wheat Storage in the Old and New Worlds

South Africa has predominantly been making use of a centralized storage system. South Africa's wheat storage system has been influenced by the commercial development of South Africa's wheat industry. There are differences between the grain-storage systems of the Old World (Europe and the Middle East) and those of the New World (North and South American countries, Australia and South Africa). As with ancient subsistence farming practices, the largest proportion of the harvest is stored on farms in the Old World. In these countries a central storage system developed only when the grain trade grew and developed. The primary goal of central grain storage and handling systems in these countries is trade, not storage.

In some younger countries, such as Australia, Argentina, Canada and South Africa, commercial wheat production developed in conjunction with central marketing and a central storage system. However, unlike South Africa, effort was also put into the development of extensive, effective farm storage systems by countries such as Australia, Argentina and Canada; although a central marketing system was also used in the past. The main reason for this difference is the shortage of farm labourers in these countries. South Africa had large numbers of unskilled labourers, who were used to transport grain directly after harvesting from the fields to a central silo. The incentive to do so was rooted in the central marketing system, according to which the farmers received their remuneration at a set price within a few weeks after delivery to the central marketing body.

In countries such as Australia, Canada and Argentina, where central marketing systems were also being used until a few years before 2000, a similar incentive also existed to ensure that wheat was delivered as early as possible, but the labourers were not available. In all these countries as few as two people cultivate a thousand hectares of land, and during the harvest there simply were not enough hands and time to transport the crop from the fields to the central silo (Viljoen, 2012).

6.2.2 Shift in wheat storage

Nearly all storage facilities in South Africa, such as centralized silos, were owned and managed by co-operatives based in agricultural regions, of which producers were shareholders. With co-operatives acting as agents for the producers, the majority of producers in South Africa made use of the infrastructure provided by them (Richter, 2009). The prices of production inputs were kept relatively low and producers were loyal to these co-operatives, because they were shareholders. This led to a central marketing system, where co-operatives delivered wheat to mills and the cost of storage, controlled by the Wheat Board, was added to the accounts of the producers (Louw , et al., 2010).

Since the structure and role of agricultural co-operatives has changed over time, the marketing channel of wheat has become more complex. Storage, processing and other support services in South Africa's wheat industry have become more diversified and decentralised. Sequential marketing, which entails the use of storage facilities, either on the farm or in the near vicinity, so that the harvest can be sold at any time of the year, have increased in South Africa. In this manner producers have been able to get more control over the selling price of the produce, as prices tend to rise from their lowest point immediately after the harvest until before the next harvest (given that imports can also influence these price trends) (Vink & Kirsten, 2002).

Agricultural marketing companies have assumed many of the functions previously hold by the Wheat Board and co-operatives, which include the buying of wheat from primary producers, providing market information and advice to producers and millers, undertaking logistical and administrative functions, as well as other functions that have arisen in the deregulated environment (National Agricultural Marketing Council, 2009A). Agricultural marketing companies have been responsible for the development of alternative storage facilities, which have increased the flexibility of wheat storage in South Africa.

With new methods of storage being constantly developed, which do not require a large capital investment, like the building of silos, wheat producers are increasingly constructing on-farm storage system. The origin of these on-farm storage systems is often the result of cooperation between producers and agricultural marketing companies. Producers are providing their own means of storage by agricultural marketing companies, by agreeing to deliver a fixed amount of wheat to that trader. By doing this, the producer will gain by saving in storage cost, as well as transport cost, while the wheat trader, in return, is guaranteed a fixed supply of wheat, which can either go to storage again, or be shipped directly to the mills.

To increase the attractiveness of SAFEX wheat futures contracts and to increase the areas that can deliver through the SAFEX contracts, new storage facilities in South Africa can also be 'listed,' to become capable of being used to initiate delivery against a SAFEX contract (Bureau for food and agriculture policy, 2005).

6.3 Storage Methods

The following segment presents a discussion on the methods of wheat storage used in South Africa by producers, agricultural corporations and agricultural marketing companies. The operational nature and strategic importance of storage methods used in the supply chain of wheat can provide insight for producers during the storage procedure:

6.3.1 Storage in Bags

The easiest way to store wheat is in bags, which manual labourers can easily manage. The bags are stacked like bricks in a wall in sheds or under canvas sheets or tarpaulins in the open air. The stacks are built up as high as possible in the shed in order to maximise use of the storage space. Outside, stacks are built to a peak to facilitate rain-water drainage and prevent water from collecting on the sheets covering the bags.

Originally these outdoor stacks were built in such a way that labourers could carry bags up "steps" and place them on top of the stack. Later, stacking machines were developed. The height on these implements was adjustable, and they could transport bags to the top of the stack, where the labourer would take over and place each bag in its proper place.

Insects could be exterminated in only one way: the stacks were sealed off and fumigated. To prevent recontamination, the outer surface of the stack was sprayed with a contact insecticide. This treatment was, however, never very effective. Nowadays, producers prefer to use more efficient means of storage, which is less labour intensive and also able to accommodate larger volumes (Viljoen, 2012).

6.3.2 Silos

Since the shift towards wheat bulk handling in 1971, agricultural co-operatives such Porterville Landbou-koöperasie (PLK), Moorreesburg Koringboere (MKB) and Kaap Agri (WPK) have invested in the construction of silos (Richter, 2009). Silos are constructed out of concrete and can provide storage for an entire region of producers. Silos are the most popular method of

wheat storage in South Africa, and are mostly owned and operated by agricultural co-operatives. Although the structure of these co-operatives has experienced significant change in the past, their infrastructure has remained crucial to the supply chain of wheat in South Africa, and they are still commonly used by producers and agricultural marketing companies.

Silos are also known as grain elevators. Grain elevators basically consist of one or more vertical cylinders called silos or silo tubes, in which grain is stored alongside the necessary handling implements to move the grain into and out of the silos. Next to the grain elevator there are one or more discharge pits where road or railway trucks dump grain to be taken up into the grain elevator.

Conveyor belts or chains transport the grain from the discharge pit to the foot of one or more bucket elevators, which take the grain to a conveyor belt or chains above the silo tubes. The bucket elevators are housed in the work tower. A tripper unleashes the grain from the topmost conveyor belt and drops it into the appointed silo tube. At the bottom of every silo tube there is an outlet valve through which the grain runs from the silo tube onto a conveyor belt or chain in a tunnel under the row of silo tubes (Viljoen, 2012).

Figure 6-1 Galvanised grain silos on a farm near Pretoria (ABC Hansen Africa, 2012)

By far the greatest proportion of South Africa's wheat-storage capacity is in the form of grain silos. Most South African silos are made of concrete, but corrugated galvanised steel plates that are bolted together, and welded steel plates, are also used for silo construction. Bolted corrugated iron is almost exclusively used for grain silos on farms.

6.3.3 Silo Bags

Safe and competitively priced grain storage has always been a challenge in the agricultural sector. Besides the ever-present risk of loss and contamination, silos and other mass storage facilities are relatively expensive (BKB Grainco, 2013A). With farmers demanding storage that is both inexpensive and easy to construct on farms, new methods of storage, commonly known as silo bags, have become a revolutionary means of wheat storage in South Africa.

With the deterioration of South African infrastructure, the cost of traditional wheat storage has lowered the competitiveness of domestic wheat. Wheat farmers are therefore increasingly storing wheat independently, by constructing galvanised grain silos on their farms. The cost of constructing these grain silos is, however, not within the financial reach of the majority of South African wheat farmers, who must rely on intermediate service providers, such as agricultural marketing companies, to provide efficient wheat storage.

This has led to agricultural marketing companies introducing the pioneering storage solution of silo bags. Silo bags, see Figure 6-2 and Table 6:1, are a laminated mix of three layers of PE (polyethylene). The first two layers act as a UV filter, with the third layer designed to keep out the sunlight. Silo bags have the capacity to hold up to 220 tons of wheat with a life period of between 12 – 18 months in the open. The bags are also designed to stretch by a maximum of 10% (Silobag, 2012).

By using state of the art machinery, see picture below, wheat is stored in an absolute anaerobic environment, with the bag being sealed and airtight (Silobags Systems, 2012). Any amount of wheat can be stored in the bag by simply cutting the bag and resealing it again. The airtight environment prevents the development and reproduction of fungi and insects. This environment can also eliminate the need for chemicals (Silobag, 2012).

Figure 6-2 Wheat being stored into a silo bag by using a grain bagging machine (Silobags Systems, 2012)

Table 6:1 Silo Bag Features (Silobags Systems, 2013)

Features	Three layer film made out of polyethylene with UV protection White on the outside to reflect sunlight Black on the inside to eliminate the penetration of sunlight
Dimensions	5,6,8,9 and 10 feet in diameter; and 200 and 250 feet long
Storage Capacity	For grain storage the 9 feet (2.7 metres) by 200 feet (61 metres) bag is used to hold up to 200 tons of grain

The innovative system of silo bags offers a range of advantages for South African farmers. This includes the following (BKB Grainco, 2013B):

- Low storage costs
- Harvesting and logistic solutions
- Enhancing of storage capacity
- On site/farm storage

- Optimum traceability
- Identify preservation of grain
- Biological pest control via anaerobiosis, no chemicals added
- No germination and low risk of insect contamination
- Better control over handling costs
- Fewer transport costs
- Better quality & quantity control

For producers to use silo bags on their farms, a few basic guidelines need to be followed (Silobags Systems, 2012):

- Bags should preferably be placed on a plain, clean, well-drained lot with good accessibility and away from trees.
- Keep the area free of weeds and animals.
- Do not use sulphide for rodent control; it will prematurely degrade the bag.
- Never exceed the allowed stretching limit.
- Be aware of outside temperature differences while bagging. The bag might have resistance to stretching at low temperatures.
- Make sure that the bag's open end lies towards the bottom of a slight slope.

With the current challenges being experienced in the wheat supply chain of South Africa, silo bags have proven to be successful in providing producers with a cost efficient logistical service. Producers are using silo bags as an alternative to traditional silos, which is now resulting in a large amount of storage space being unused.

6.4 Wheat-Handling Machinery

Wheat-handling machinery is an integral part of wheat bulk-storage. The bulk handling of wheat requires special machinery to be used for moving wheat from one place to another. Gravity is used in most cases to help with the flow. The following kinds of grain-handling machinery are most commonly used in storage (Viljoen, 2012):

- Conveyor belts which are used to move grain horizontally or at a shallow gradient. The gradient must always be much shallower than that at which the grain will begin to flow.
- Conveyor chains are also used to move grain horizontally or at a shallow gradient.

- Augers are used to move grain horizontally, at a gradient, or even vertically.
- Bucket elevators are used to move grain vertically.
- Pneumatic conveyors can move grain horizontally, at a gradient, or even vertically.

6.5 Chapter Summary

This chapter analysed the storage of wheat in the context of wheat producers.

New development in wheat storage decreases local wheat farmer's dependence on existing silos, which have been negatively affected by the deterioration of agricultural railway branch lines, connecting centralized storage facilities to South Africa's major railway network.

Also, as discussed in Section 6.2.2, new storage facilities can be "listed" on SAFEX to enable delivery against a future contract. In order for farmers to hedge his crop against price risk by making use of SAFEX instruments, farmers must make use of registered storage facilities. Failure to register storage facilities can limit farmer's marketing alternatives by excluding delivery on a SAFEX contract.

The history of commercial wheat production in South Africa was considered. The central marketing system, used prior the transformation of South Africa's agricultural sector, has led farmers to neglect the possibility of providing their own means of infrastructure, which included on farm storage. If producers in South Africa were able to imitate the same marketing approach as countries such as Australia and Canada, where a central marketing system is used in conjunction with a farm storage system, the deterioration of South Africa's logistical infrastructure would have had less effect on producers in South Africa

CHAPTER 7

ECONOMIC FORCES OF INTERNATIONAL TRADE

7.1 Introduction

The following chapter provides an elucidation of wheat trading from an economic perspective. It aims to interpret the influences of the economic forces of the international markets and the effect this has on the local market.

Through the large amount of wheat imported into the South African market, our market price is bound to international trade regulations and other economic activities, which directly influence the wheat market of South Africa. These events are either rooted in government intervention or in the natural mechanism of a free market.

The ability to adapt has become a crucial requirement for wheat producers in South Africa. In order for wheat producers to minimize risk and prevent capital loss, producers need to understand the economics and regulations of international trade. The factors which will be discussed in this chapter, cannot be prevented directly by domestic producers, but can be managed only by taking the necessary precautions.

This chapter primarily addresses research objective 7. During the latter sections of this chapter objective 8 is partly addressed as well (refer to Section 1.3). This chapter will specifically address subsidized wheat and import tariffs in South Africa's wheat industry as was identified in Chapter 4.

7.2 Landed Cost of International Wheat

The price of future contracts for wheat in South Africa is determined by the demand for domestic and international wheat. The competitiveness of locally produced wheat is influenced by the landed cost of international wheat. The landed cost of international wheat is determined by the following:

- Import tariffs
- Reference price
- Restriction on exports
- International transport cost
- Government support (subsidising)
- Exchange rates

7.3 Import Tariffs

Tariffs are used by the government to protect local production from the competition of imported products. The imposing of tariffs results in a higher importation cost, which is transparent in the retail price, and therefore decreases the competitiveness of the imported product. Neoclassical economic theorists view tariffs as distortions of the free market. Typical analyses find that import tariffs benefit domestic producers and governments, but negatively decrease the welfare of domestic consumers (Blanchard, 2009).

7.3.1 The Effect of a Tariff

The imposing of tariffs reduces welfare due to higher prices and restricted choice for the consumer. Deadweight loss is created due to a lack of allocative efficiency. Refer to Figure 7-1, where the welfare consequences of imposing an import tariff are explained:

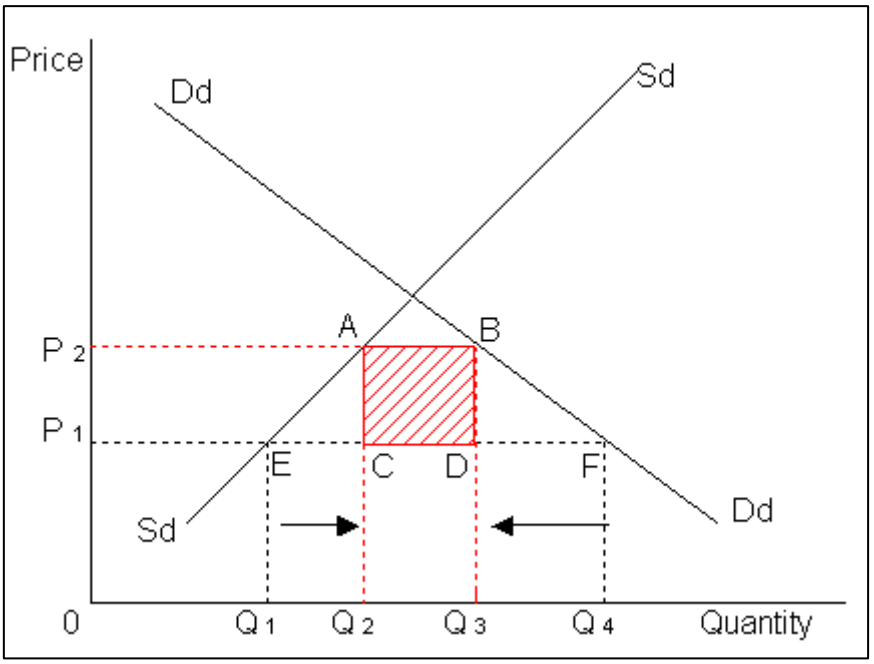

Figure 7-1 The Effect of a tariff (Charles Sturt University, 2013)

At price level P1, the domestic quantity supplied is Q1, with the domestic quantity demanded at Q4. The difference between Q1 and Q4 is filled by imports from abroad. After the imposition of a tariff, domestic price rises from P1 to P2 + t. At this new price level, P2 + t, the domestic quantity supplied increases to Q2. Due to the higher price, the domestic quantity demand decreases to Q3. This subsequently decreases the quantity of imports needed to fill the difference between Q2 (Domestic supply) and Q3 (Domestic demand).

With the imposing of import tariffs, revenue is being generated by the government, as indicated in the diagram, with producer surplus being increased. This, is however, generated at the expense of consumer surplus, which subsequently creates a loss of welfare. The loss of welfare is a result of the fact that the revenue gained by the government and the increase in producer surplus is smaller than the net loss of consumer surplus caused by the import tariff.

7.3.2 South African Wheat Tariffs

The imposing of wheat tariffs has been an issue much debated in South Africa. This is predominantly an issue among domestic farmers, who are faced with the challenge of competing against international producers. Since the early 1990s the government has moved away from a policy of self-sufficiency in food production towards a policy relying on the importation of cheap subsidised wheat from global markets (Van Schalkwyk, 2008). In order to

obtain wheat freely from international markets, the South African government is avoiding the imposition of high import tariffs, leaving local farmers unprotected from global forces.

Although South Africa has implemented a free trade policy, tariffs can still be imposed to protect domestic producers in times of low profitability. Grain South Africa has been in a fierce battle with the government over the increase of wheat import tariffs. Wheat producers in South Africa are in need of import tariffs, to increase the competitiveness of domestic wheat production. The government's decision to open up the domestic market to global forces, accompanied by transport and infrastructure problems, makes it difficult for producers to compete against less expensive wheat imports. Grain South Africa feels that the current tariff dispensation system, where tariffs are triggered according to a world reference price, as will be discussed in the following section, does not provide enough protection for producers in South Africa.

The imposing of tariffs will not only increase the competitiveness of local producers, but will also generate an inflow of capital for producers and the government, which will serve as encouragement for farmers to increase production. This will in return generate much needed job opportunities for the agricultural sector. The imposing of higher wheat tariffs will, however, not be so simple. The South African government understands the need for higher tariffs in order to increase production, but also wants to maintain a lower price index. Although tariffs are to the advantage of producers and the government, the consumer will suffer from an increase in food price.

7.3.3 Tariff Reference Price

As mentioned in the previous section, wheat import tariffs in South Africa are based on a tariff reference price. The following section describes how a reference price is used as an import tariff and what the current tariff reference price for wheat is in South Africa.

When using a reference price, an import duty is triggered when a world reference price is trading below a predetermined price. This means, in order to protect local producers from cheap imports, import tariffs come into effect when a world reference price is below a tariff reference price. If the world reference price is trading above the tariff reference price, the product will be able to be imported duty free.

A tariff reference price can be determined by using an average trading price, compensating for any adjustments, minus the cost of transport. The $215 tariff reference price for wheat in

South Africa, implemented in May 2010, was based on a five year average US No. 2 HRW Gulf fob price ($/ton) calculated at $236/ton plus an adjustment for distorting factors of 10.27% ($24/ton), less the average ocean transport costs of $45 per ton (average over the latest five year period) of importing wheat to a South African port. (Van der Vyfer & Nordier, 2013)

The world reference price for wheat in South Africa is based on a three week moving average of the US No. 2 HRW Gulf settlement price. Once calculated, this world reference price will apply to all types (and quality) of imported wheat irrespective of the countries of origin. The world reference price will be compared to the tariff reference price, also referred to as a domestic reference price, on a weekly basis, in order to calculate a new duty. The dollar specific duty will be converted to rand according to the rand/dollar exchange rate on the day that the adjustment is triggered. Referring to Table 7:1, an example can be seen of how wheat duties are calculated in South Africa. On the 25 of June 2013, the three week average of US No. 2 HRW wheat prices traded around $323 per ton, with the tariff reference price set at $215 per ton. Due to the world reference price being greater than the tariff rate, the duty for wheat imports was negative by R979.56, based on the rand/dollar exchange rate of R9.07 per dollar.

Table 7:1 World Reference Price Calculation (Van der Vyfer & Nordier, 2013)

World reference price: Three week moving average of the US No. 2 HRW Gulf settlement price	$323
Tariff reference price	$215
Dollar duty on wheat	($215-$323)= -$108
Rand duty on wheat	(-$108 x R9.07) = R979.56

With a negative margin, wheat will be imported duty free. By referring to figure 7-2 it can be seen that with a tariff rate of only $215 per ton, the world reference price has traded frequently above the tariff price over the past 5 years, meaning wheat has been able to be imported into South Africa duty free.

Figure 7-2 World reference price (2000 – 2013) (Van der Vyfer & Nordier, 2013)

In May 2013 the Minister of Trade and Industry signed off a higher reference price level for imported wheat in South Africa. In order to create a more competitive industry, the ITAC of South Africa recommended a new reference price level for wheat at $294/ton. This will be an increase of $79 from the previous level of $215/ton. Although the world reference price might still be trading above the tariff rate, the world reference price does not need to trade near $215 levels, but on $294 levels before local producers will be protected by the import tariffs (Tsengiwe, 2013).

7.4 Government Support

Subsidies are being provided to producers in order to increase production and generate surpluses which can be used for exports (Van Schalkwyk, 2008). Wheat producers in South Africa have long argued that government support in developed countries is unfairly affecting the competitiveness of South Africa's wheat industry. Wheat producers in developed countries, such as Germany, United States and Canada, from which South Africa import, are receiving substantial financial support from their governments. Subsidies offered towards wheat producers are based on the market price of wheat, the level of disaster and other variable factors.

Subsidies are used in agriculture to supplement the income of local producers, manage the supply and influence the cost of commodities. Subsidies can be triggered during periods of low prices or can be implemented regardless of the financial need of the recipients or the financial condition of the agricultural industry. The USA spends, on average more than $20 billion on agricultural programmes a year, of which $17.5 billion goes to 15 – 20% of farming operations and $2.5 billion to private agricultural insurance companies (Smith, 2013). Between 2009 and 2012, the US Department of Agriculture has paid out an estimated $7 billion dollars on various wheat subsidising programmes, as can be seen in Figure 7-3

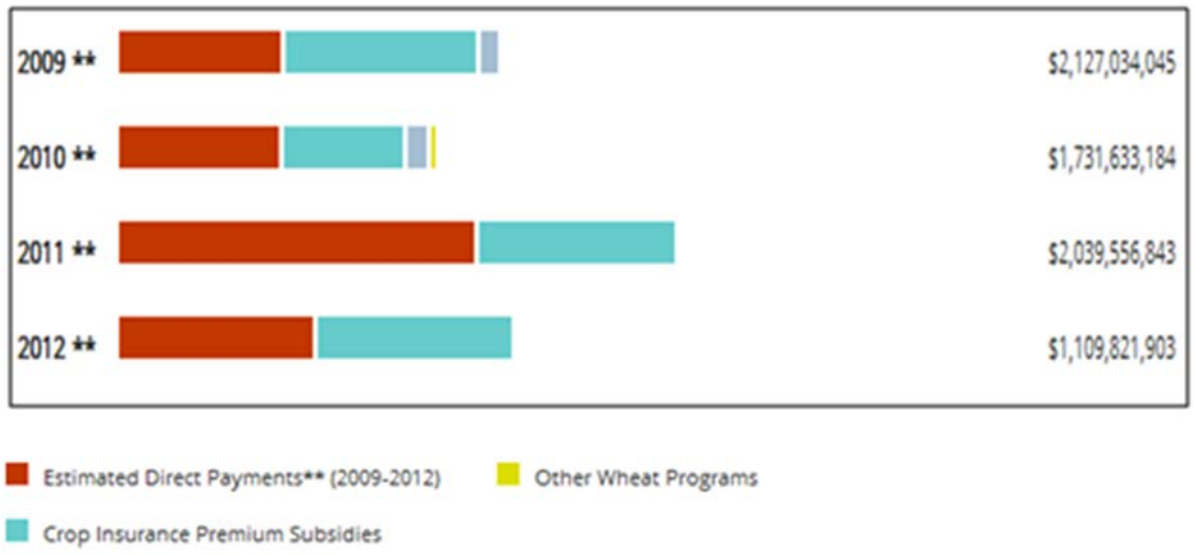

Figure 7-3 Estimated subsidies paid out to farmers in the USA (2009 – 2012) (EWG, 2013)

7.4.1 Subsidising Programmes

By referring to figure 7:3, it can be seen that the USA implements a range of wheat subsidising programmes, including direct payments and crop insurance subsidies. The following section will give a brief description of these agricultural subsidising programmes and other programmes implemented (Edwards, 2013):

7.4.1.1 Direct payments

''Direct'' payments are cash subsidies for producers based on a historical measure of a farm's hectares used for production. Direct payments carry the risk of farmers receiving subsidies for land no longer being used for wheat farming.

7.4.1.2 Marketing Loans

Marketing loans provide subsidies by paying farmers a guaranteed minimum price for wheat. The marketing loan programme encourages overproduction by setting a floor price on wheat prices and by reducing the risk of price variability which farmers face in an open market.

7.4.1.3 Countercyclical Payments

Countercyclical payments are similar to marketing loans, by providing subsidies when market prices are lower, and thus encouraging excess farm production. Countercyclical payments, however, are measured by historical production, whereas marketing loan subsidies are based on current production. Countercyclical payments are therefore less distortionary than marketing loan payments.

7.4.1.4 Conservation Subsidies

Conservation subsidy programmes are used to respond to damages caused by over-production. Conservation subsidies are paid to farmers not to grow wheat, but to alternatively cultivate land.

7.4.1.5 Insurance and disaster aid

In order to protect farmers against adverse weather conditions, pests, and low market prices, both 'yield' and "revenue" insurance is available. Government subsidies are provided for producers to cover the cost of insurance premiums. Disaster aid is special payments by a government during state declared disasters. Disaster assistance can be an additional payment to insurance subsidies.

7.4.1.6 Export Subsidies

Export subsidies include government support which encourages exports. This may include marketing assistance in foreign countries or tax reductions during exports.

7.4.1.7 Agricultural Research and Statistics

Governments can provide agricultural organization subsidies for research and education. This may include agricultural statistical services and economic studies.

7.4.2 Effect of Subsidies

The implementation and justification of agricultural subsidies are often complex and controversial. Subsidies are used to protect farmers against bad weather conditions, pest and

volatile markets to ensure food security and rural development. Although the World Trade Organization has noted that that subsidies can drive down costs and provide cheap food for developing countries, low prices are also harmful to farmers not receiving subsidies.

Government subsidies reduce the risk of price variability and bad weather conditions, which encourage excess production. The increase in global wheat supplies, decreases the international market price of wheat, resulting in the export of surplus stock into developing countries at low cost. Local farmers, not receiving subsidies, are pushed out of the market due to the competitiveness of international wheat, decreasing the economic self-sufficiency of their home country. This process is known as 'International dumping".

Governments, as in South Africa, are often reluctant to protect local farmers due to their dependency on cheap imports. Developing countries are also not capable of providing famers with government support in order to increase the competitiveness of domestically produced wheat. Agri South Africa (AgriSA) executive director Hans van der Merwe says the return of providing subsidies to South African farmers, as a means of increasing domestic production, is not an option (Van Schalkwyk, 2008). Developing countries simply can't afford to compete by matching the immense subsidies paid to farmers in the developed world. Not only does South Africa lack the financial ability, but such action would also subsequently increase food prices.

The World Trade Organisation (WTO) aims to restrict unfair competition and decrease distortion to the sector. Trade is distorted when market prices are higher or lower, or quantities produced, bought or sold are higher or lower, than it would have been in a normal competitive market. The Uruguay Round produced the first agricultural multilateral agreement by the WTO in 1995, dedicated to the reform of agricultural trade through continuous negotiations between trading nations (World Trade Organization, 2013). The objective of the agricultural agreement is to reform trade through market-orientated policies that would improve predictability and security for importing and exporting countries, by focusing on trade restrictions (market access), subsidies (domestic support) and export subsidies, used to make the market artificially competitive.

The WTO does however allow governments to support their agriculture sector, but with the requirement that any form of trade distortion must be avoided. The agricultural agreement also allows flexibility in the implementation of WTO obligations. Developing countries, such as South Africa, do not have to cut their subsidies or lower their tariffs as much as developed countries, and least-developed countries don't have to do this at all. Special provisions are also

made by the WTO to countries that rely on imports for their food supplies, including giving extra time to implement WTO obligations (World Trade Organization, 2013).

During the WTO Uruguay Round of negotiations on agriculture, developed countries pledged to cut subsidies by 25%. This has not happened. Supporters of agricultural subsidising programmes are arguing that subsidies stabilize agricultural commodity markets, aid low-income farmers, increase returns to farm investments, aid rural development, compensate for monopoly in farm input supply and farm marketing industries, help to ensure national food security and offset the effect of farm subsidies provided by other countries (Summer, 2013). With developing countries, such as South Africa, becoming increasingly dependent on cheap wheat imports, it is uncertain how local producers can reduce the impact of subsiding programmes without support from the government.

7.5 Restriction on Exports

With South Africa increasingly importing wheat from abroad, the country is increasing its dependence on international wheat production. With a decrease in South Africa's self-sufficiency index, the risks of being dependent on international producers could lead to a serious food crisis concern in the future. The South African government aims to maintain a free market without any restriction on imports, in order to obtain wheat freely and economically. This leaves domestic producers unprotected from global forces, which in turn is decreasing South Africa's production output, leading to more imports.

The risk of neglecting domestic producers and decreasing a country's self-sufficiency index lies in the possibility of a commodity becoming either unobtainable or too expensive to import. In the case of wheat, major wheat producing countries may place limitations on exports in order to secure a supply of wheat for their domestic market. This subsequently increases the international market value of wheat, due to a decrease in supply.

Restrictions on exports can be placed by governments either when domestic consumption dramatically increases or when domestic production experiences low outputs. Restrictions, or export quotas, are especially critical where the market value of domestic wheat is inferior to the export value. Governments need to exercise control over domestic producers to secure an affordable supply of wheat for domestic consumption, before surpluses are exported.

In 2010, Argentina, South America's largest producer of grain, experienced a major production decline, due to drought. Exporting restrictions were subsequently imposed, leading to the

smallest amount of wheat exported in almost three decades (Department of Agriculture, Forestry and Fisheries, 2012). As can be seen in Figure 7-4, wheat imports from Argentina to South Africa led to a dramatic decline due to the imposing of government restrictions. This was in stark contrast to the 800 000 tons of wheat imported in the year 2008. Wheat was alternatively imported from the USA and Canada (Orihuale, 2011)

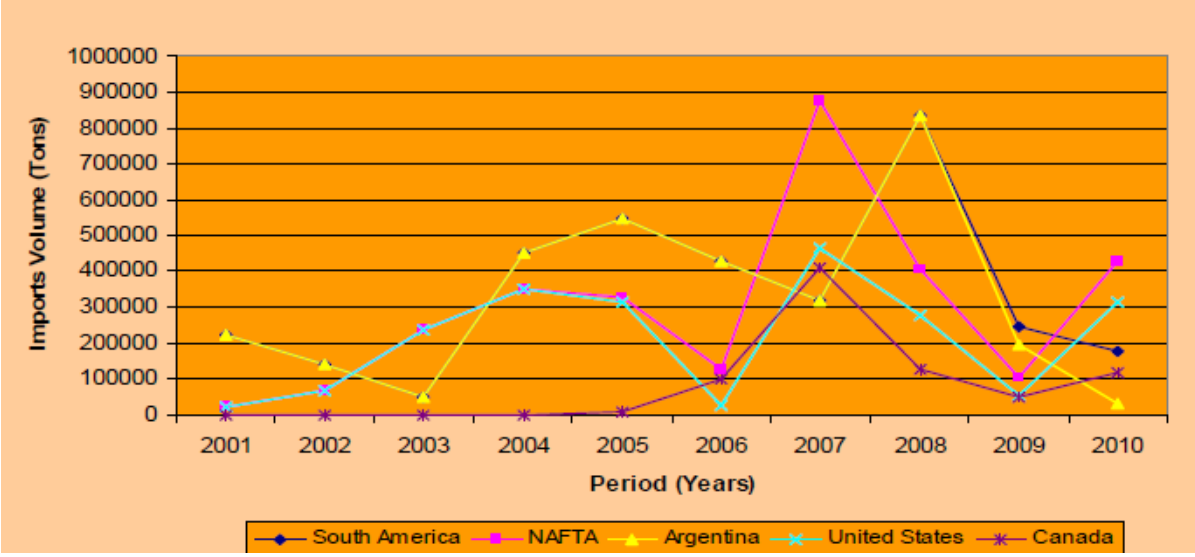

Figure 7-4 Wheat imports from the Americas (Department of Agriculture, Forestry and Fisheries, 2012)

Argentinian exports were also affected by domestic government quotas, which required farmers to sell about 8 million tons of their grain to local mills. This led to farmers in Argentina conducting a week-long strike demanding that the government eliminate restrictions for all future crops and "normalize" grain markets to let them trade freely (Orihuale, 2011). This emphasized the fact that farmers in Argentina generated greater returns by exporting wheat as an alternative to supplying to their domestic market.

In the context of the drought experienced in Argentina, which subsequently demolished their ability to supply wheat for the international market, South Africa's dependence on imports came under scrutiny. Although wheat was alternatively imported from Canada and the USA, the pressure of supplying affordable wheat to the South African market became greater (South African Grain Information Service, 2013B). With the global concern of a potential food crisis in the near future, export restrictions are a major threat for the food security of South Africa. Changes in weather conditions, overpopulation and volatile market conditions are scenarios

which could result in nations shifting their focus to food sovereignty. Instead of exporting surpluses, governments may impose restrictions on exports as means of insuring market and food stability. This will increase the market price of wheat internationally, leading to major food concerns for countries experiencing a low level of self-sufficiency.

If domestic producers are neglected, the risk of export restrictions is far greater. Export restrictions do, however, increase the competitiveness of domestic producers, but at the expense of the consumer. In order for South Africa to counter the risk of exporting restrictions, a balance needs to be obtained between imports and domestic supply. This will ensure that enough safe food is physically accessible to South Africans, ensuring food security, accompanied by affordability.

7.6 International Transport Cost

Changing patterns of globalization affect demand for transportation and transport costs. The competitiveness of domestically produced wheat is influenced by the shipping cost of imported wheat. An increase in international transport cost increases the market value of domestic wheat, which leads to greater returns for domestic producers. After imported wheat reaches storage in South Africa, the same transport infrastructure is used to distribute both imported wheat and domestic wheat, as indicated in the Figure 7-5 (Department of Agriculture, Forestry and Fisheries, 2012). Imported wheat is therefore subjected to the same wheat transport challenges in South Africa as domestically produced wheat.

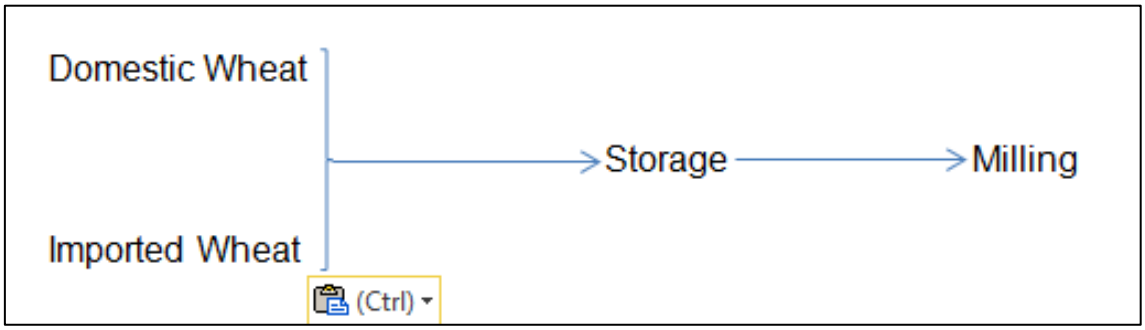

Figure 7-5 Wheat distribution in South Africa (Department of Agriculture, Forestry and Fisheries, 2012)

As mentioned in a previous section, wheat is transported across oceans using bulk carriers able to accommodate the physical characteristics of grain. With a tendency among shipping companies to use oversized vessels to transport bulk commodities, wheat can be imported at

relatively low costs through economies of scale. This, however, requires Transnet to provide the necessary port infrastructure to accommodate large vessels. This necessitates deeper drafts and effective unloading facilities at South African ports to ensure our participation in imports (De Villiers, 2009). For Transnet to provide efficient port infrastructure, taxes and levies will subsequently be transparent in the import price of wheat.

7.7 Exchange Rates

It is of critical importance that domestic producers assess the influence of the South African exchange rate. The exchange rate dictates the profit potential between two trading partners. With an increasing amount of wheat imported into South Africa, as well input cost such as fertilizers and tractors, the market value of domestic wheat is largely influenced by the value of the Rand.

The value of a currency is determined through the economic activity of a country. An economic downturn in a major wheat exporting nation can drop the value of their currency which, in turn, can decrease the cost of purchase for South Africa. This can lead to an increase in wheat imports, which can result into a lower level of domestic production, due to a decrease in the competitiveness of domestically produced wheat (Binkley, 1983).

It is, however, important to understand that an economic downturn in an exporting nation can also lead to a lower level of wheat production in that country. This can lead to a restriction on wheat exports, which will subsequently increase the value of the available wheat and thus eliminate the benefits of a stronger exchange rate.

7.8 Chapter Summary

This chapter presented and evaluated the influences that the economic forces of the international markets exert on the local market.

It found that import tariffs provide a solution to increase wheat production in South Africa. This is achieved through its inherent facility to decrease the competitiveness of imported wheat.

This, however, leads to a rise in food inflation, caused by the increase in wheat prices. The South African government is therefore faced with the trade-off between stimulating wheat production and decreasing the food price index of South Africa.

CHAPTER 8

THE ROLE OF THE SOUTH AFRICAN GOVERNMENT

8.1 Introduction

The Department of Agriculture, Forestry and Fisheries is the department of the South African government which is responsible for the development and sustainment of the wheat production sector of South Africa. Their role is to ensure access to sufficient, safe and nutritious food for the country's population. It is their responsibility to provide food security for South Africa, which is defined by the availability and affordability of food in the free market. It is the responsibility of the Government to provide a policy environment wherein competition drives down prices, stimulates economic growth and creates jobs which will provide the means to buy food. It is also the role of the government to provide a social safety network to help those in distress, and lastly, provide an infrastructure to ensure a proper support system for the market, to maintain food affordability (De Villiers, 2009).

The vision of the Department of Agriculture, Forestry and Fisheries is achieved through developing and sustaining a sector that contributes and embraces (Department of Agriculture, Forestry and Fisheries, 2012):

- Economic growth (and development)
- Job creation
- Rural development
- Sustainable use of natural resources
- Food security

In this chapter the investigation of the role of the South African government in the wheat production sector of South Africa is undertaken. It discusses the potential role the South African government can portray in the advancement of the industry. Focus is on issues which are of interest to domestic producers, and which may hold the future of wheat production.

This chapter addresses research objective 8 (refer to Section 1.3). Discussions in this chapter will include rural development, managing the wheat reserves and infrastructure development as identified as themes in Chapter 4.

8.2 Infrastructure Development

Infrastructure development has a fundamental importance in the economic growth of South Africa. The decrease in South Africa's wheat production output is largely influenced by the current condition of our infrastructure. The central marketing system incorporated by wheat producers in South Africa has led to farmers being heavily dependent on the availability of infrastructure.

Wheat production requires effective logistical wheat handling services, which include transport and storage. The deterioration of South Africa's infrastructure is leading to the absence of critical logistical services. Although storage capacity is currently in huge supply, it is the lack of an operative transport system which is resulting in additional costs for wheat producers. The transport infrastructure connecting the value chain, including wheat producers, storage facilities and the milling industry, is critical for the development of wheat production. Although numerous intermediate service providers, including agricultural marketing companies, are launching attempts to provide more cost efficient logistical services, it remains the responsibility of the government to invest in an infrastructure which will improve the overall efficiency of logistical services in the supply chain of wheat.

As mentioned in Chapter 5, nearly 80% of South Africa's road network is older than its original twenty year – year design life (Department: Performance Monitoring and Evaluation, 2012). Under-investment by the South African government has resulted into a huge backlog cost in road maintenance and rehabilitation. Current damages to South African roads, caused by congestion and lack of continuous maintenance, are increasing the cost of wheat transport, thus decreasing revenue for producers. It is the responsibility of the South African government to upgrade and maintain South Africa's road transport network in order to maintain market access for wheat producers in South Africa.

Also discovered in earlier chapters, South Africa is, urgently, in need of an improved railway system to help decrease the cost of wheat transport. Transnet needs to upgrade our railway network in order to decrease the use of the far more expensive road transport, which currently experiences massive congestion. Transnet has, however, acknowledged the need for

an infrastructural investment, specifically on rail, with numerous plans being considered to upgrade our current transport infrastructure.

In President Jacob Zuma's State of the Nation address in February 2012, he said that Transnet had announced the details of a R300-billion investment in infrastructure that it says "will create over half-a-million new jobs while making its freight rail division the fifth-largest in the world". Transnet CEO Brian Molefe said the state company's prime objective was "to invest in building capacity to meet validated market demand that will enable economic growth" (South Africa Info, 2012).

South Africa's rail, port and pipelines infrastructure would be significantly upgraded and expanded over the next seven years, resulting in "a significant increase in freight volumes," Molefe said, while leading to a "significant modal shift from road to rail". The lion's share of Transnet's R300-billion capital investment programme, R205-billion, would be spent on rail projects as Transnet pushes to increase rail volumes. This increase would significantly reduce the cost of doing business in South Africa, Transnet said, citing internal studies showing that rail in the country was on average 75% cheaper than road transport. A large-scale shift in freight transport from road to rail would also "address costs, congestion and reduce carbon emissions," the company said (South Africa Info, 2012).

8.3 Managing Wheat Reserves

It is important for the government of South Africa to manage our wheat reserves. The main objective of a wheat reserve is social/humanitarian in nature, but can also have political connotations related to the management and operation of the reserve. While there are basic principles for the management and operation of a reserve, due to the social implications of a food shortfall, the government needs to retain some powers of discretion over the use of the reserve. The extent to which the government would want to, or should, exercise control could vary, but it is important when designing the overall structure for the management and operation of a reserve, that a decision has to be taken relating to the responsibilities to be retained by the government and those to be delegated to the agency charged with the management and operation of the reserve.

The following main responsibilities should, however, remain under the control of the government (Lynton-Evan, 1997):

- monitoring the performance of the entity charged with the management and operation of the reserve, and taking the necessary action to correct adverse trends;
- ensuring that the entity is acting in accordance with its approved mandate;
- monitoring the efficiency with which resources entrusted to the reserve are being utilised;
- reviewing the audited accounts of the reserve's activities;
- modifying or otherwise adjusting the mandate, i.e. authority and responsibilities, of the entity to meet changing circumstances;
- authorising actions to be undertaken which involve the government incurring additional costs, i.e. increasing the resources available to the reserve, sanctioning releases of grain for relief actions.

In determining the responsibilities which remain with the government it is important that the government avoid using its authority to interfere directly with the management of the reserve. This is particular important in South Africa, where the promotion of social actions can be interpreted as having political objectives. It is important that decisions which are of operational nature should be taken by entities responsible for managing the reserve.

In order to avoid misunderstandings between the South African government and the entities and traders who have a responsibility in managing the reserve, it is advisable to make use of an Operational Procedures Manual, which clearly specifies the responsibilities of the government. This would provide distinction between respective roles and ensure that government interference is kept to a minimum.

It is important that the South African government allocate responsibility to the private sector in the management of South Africa’s wheat reserve. Although agricultural marketing companies have an existing role in the operations of South Africa’s wheat reserve, it would be of significant importance if wheat producers are able to gain more responsibility. By contributing to the operations of South Africa’s wheat reserve, wheat producers would be able to increase their market power when dealing with the South African government. With a greater private sector presence in the management of the reserve, it will be to the advantage of the following (Lynton-Evan, 1997):

- opportunities for the government to interfere in the management and operation of the reserve are significantly reduced;

- greater transparency in the management and operation of the reserve;
- greater attention paid to the cost effectiveness of the reserve's operations;
- reduced likelihood of market operations undertaken by the reserve adversely distorting the grain market;
- strengthening of private sector confidence in the government's policy of non-interference in the grain market;
- encouraging an increased willingness of private sector traders to recognise the reserve more as a partner than a threat.

8.4 Rural Development and Land Reform

The South African government, through the DRDLR has a mission to initiate, facilitate, coordinate, catalyse and implement an integrated rural development programme. Their strategy is to bring "fundamental change in the relations (systems and patterns of ownership and control) of land, livestock and the community" (Department of Rural Development and Land Reform, 2012). The government wants to enable rural people to take control of their destiny, with the support of the government, and thereby eliminate rural poverty through the optimal use and management of natural resources.

The DRDLR have implemented a series of strategies to achieve the above mentioned objectives. These strategies include, but are not limited to, the following (Department of Rural Development and Land Reform, 2012):

Rural Development:

a) Improved economic infrastructure
b) Improved social infrastructure

Land reform:

a) Increasing the pace of land redistribution
b) Increasing the pace of land tenure reform
c) Speeding up the settlement of outstanding land restitution claims
d) Effective support to all land reform programmes through land planning and information

Land distribution in South Africa, with the focus on emerging farmers, is a major concern for producers. The uncertainty of government intervention, among producers, can lead to farmers

abandoning the agriculture sector. Retiring farmers might feel encouraged to sell land, instead of passing on land to their children, due to risk of land redistribution. With the inefficiency of emerging farmers, as will be discussed in the following section, South Africa's food security might be put at risk.

8.5 Emerging Farmers

Land reform is accompanied by emerging farmers. The position of emerging farmers is a controversial issue in the agricultural sector of South Africa. As part of the post-1994 aspirations, the Government aims to rectify the imbalance in South African agriculture, where less than 20% of farmers produce more than 80% of the total national agricultural products. In order to increase the number of previously disadvantaged farmers, the government aims to transfer 30% of agricultural land through the land distribution programme to black emerging farmers by 2014.

However, emerging farmers that have gained, through the land transformation and distribution programme, often struggle to sustain the previous levels of productivity of the land. This is due to inexperience in macro-agriculture and a lack of resources. The Department of Agriculture has identified six areas where greater support, to emerging farmers needs to be extended, namely (The National Chamber of Milling, 2005):

- Technical and advisory services;
- Information and the management of knowledge;
- Training and capacity building;
- Marketing and business development;
- On-farm and off-farm infrastructure and production inputs, and
- Financial support.

Unfortunately, even with massive government support, few emerging farmers have prevailed successfully. In many cases, emerging farmers have reverted back to subsistence type farming on land which was previously productive and successful commercial farms. This phenomenon can have a devastating effect, not only on our country's food security, but also on our unemployment rate and farmers' future opportunities and development (Boonzaaier, 2009).

8.6 Chapter Summary

This chapter presented an investigation into the role of the South African government in the wheat production sector of South Africa. It discussed the potential role the South African government can play in the advancement of the industry.

It established that the lack of success of emerging farmers in South Africa's RDP is a major concern for agriculture in South Africa.

The trend is that large farms are increasingly being extended to achieve economies of scale, because medium sized farmers often struggle to manage these effectively. With the government trying to help small farmers establish themselves and contribute to the country's food supply, there is a strong sense that the South African government should rather use its limited resources to improve the rural infrastructure required for commercial agriculture.

CHAPTER 9

CONCLUSION AND RECOMMENDATIONS

9.1 Summary

The protection of South Africa's agricultural sector and more specifically, the wheat industry is vital to ensure the food security and rural development of the country. The wheat industry contributes about R 4 billion to the gross value of agricultural production in South Africa and currently provides about 28 000 job opportunities. Preceded by maize, wheat is the second most important grain produced in South Africa (Van der Vyfer & Nordier, 2013).

Wheat production in South Africa has decreased significantly over the past two decades (Van der Vyfer & Nordier, 2013). The wheat industry is currently struggling to generate sufficient revenue for producers for it to remain a financially feasible/viable crop (Visser, 2010). Producers are either shifting their focus to more profitable commodities or completely abandoning farming.

The broad objective of the study was to define the dominant factors which influence wheat production in South Africa. To achieve this, a thorough literature review was undertaken, as well as inputs gathered from various stakeholders and members of the post-harvest logistical process. From here the dominant factors emerged and were further investigated and analysed.

This thesis has made research contributions that begin to address the dominant factors which influence wheat production in South Africa. These were identified as wheat transport, wheat storage, the influence of the international markets, and the role of the South African government. Other influences were also determined and further investigated, but considered minor in comparison.

9.2 Key Findings

The decrease in hectares planted with wheat in South Africa suggests that the industry is struggling to generate sufficient revenue for its producers for it to remain a financially feasible crop. The feasibility and further sustainability of South Africa's wheat industry is influenced by the efficiency of post-harvest logistical activities and the variable market related forces.

In the following sections the key findings of the research undertaken is highlighted, with proposals to increase the competitiveness of the South African wheat industry.

9.2.1 Wheat Transport

Agricultural transport infrastructure has deteriorated, which has decreased the efficiency of wheat transport services in South Africa. Agricultural railway lines in rural areas are unreliable and inconsistent. Branch lines, which connect storage facilities to major railway lines, have been neglected, forcing the wheat industry to make use of road transport, a transport mode proven to be far more expensive.

The deterioration of South Africa's transport network influences the efficiency of agricultural transport. In order to decrease transport expenses of producers, South Africa needs to upgrade its current transport infrastructure. Due to the unreliability and unavailability of railway services, Transnet urgently needs to invest in South Africa's railway infrastructure. This is especially important in agricultural areas, where branch lines are required to connect storage facilities with major transport networks. Although Transnet is arguing that agricultural railway lines are not financially viable due to the inconsistency of demand, a possible solution can be, to operate these lines under a different cost regime. This might change the profitability of agricultural railway lines, which would justify the upgrade and continuous maintenance of transport networks in agricultural areas.

9.2.2 Wheat Storage

Newly developed on-farm storage systems provide greater flexibility to the wheat industry. Farmers and agricultural marketing companies are able to respond more proficiently to changes in the market. Traditional storage facilities, owned by agricultural co-operations, are still in demand, however, the use of alternative storage facilities have increased significantly in recent years.

It is recommended that producers start constructing their own storage facilities. The technical advances in storage methods, such as silo bags and galvanised grain silos, which are provided by agricultural marketing companies, make it financially viable for more producers to invest in on-farm storage facilities. The advantage of on-farm storage is the flexibility it provides. In order to respond to changes in market conditions, it enables them to better manage wheat delivery during volatile market conditions. Producers, however, will have to implement a market orientated approach in order to capitalise on favourable market conditions.

On-farm storage will also provide producers more flexibility in transport, due to the decrease of dependency on the transport infrastructure provided by regional storage facilities. This can be especially important if an alternative transport network is to be introduced as a means to improve transport efficiency.

9.2.3 Economic Forces of International Trade

The open market policy, implemented by the South African government, allows for the importation of internationally produced wheat. Local wheat farmers are forced to compete against low international market prices. Developed countries export cheap subsidized wheat, which lowers the demand for domestic wheat, decreasing the market price of wheat in South Africa. The South African government are avoiding the imposition of high import tariffs, in order to maintain a lower food price index, leaving the local wheat industry unprotected from global forces.

Although government intervention can improve the competitiveness of domestic wheat immediately by imposing restrictions on wheat imports, this would subsequently lead to an increase in the market price of wheat in South Africa, and thus increase food inflation. It is therefore critical that the increase of financial returns for wheat producers in South Africa ensue without relying on an increase in the wheat market price. This should be achieved by increasing the efficiency of the post-harvest wheat handling activities.

9.2.4 The Role of the South African Government

Agricultural land being transferred to black emerging farmers through the land distribution programme is struggling to sustain previous levels of productivity. Already limited resources are being used for development of small scale emerging farmers proven to be commercially unsuccessful due to inexperience in macro-agriculture.

9.3 Future Research

In terms of short comings to the study, the vast combination of marketing and logistical factors which influence the competitiveness of the South African wheat market, as was identified, requires further investigation in detail. Although the study was able to identify and discuss the dominant factors and the integration thereof, further investigation can reveal the direct impact of relevant forces on post–production costs and wheat production trends in South Africa.

This may include a detailed analysis of the following:

- A calculation of the demand required for agricultural railway lines to run efficiently. This will be particularly important when calculating the transport cost of wheat in South Africa, based on the location differential system, at different levels of volume flows.
- A calculation of the cost of using an on-farm storage system. This includes comparing the fixed cost of constructing an on-farm storage system compared to the variable cost of using a centralized storage facility.
- An estimation of the impact of import restrictions on the market price of wheat in South Africa. Further analysis will be required to calculate the income generated by import tariffs and the subsequent effect it will have on wheat production in South Africa.

-o0o-

BIBLIOGRAPHY

ABC Hansen Africa, 2012. *Silos and Grain Handling.* [Online]
Available at: http://www.abchansenafrica.co.za/silos/silos.php
[Accessed 26 June 2012].

Aginfo Trading, 2013. *Business Profile of Aginfo Trading.* [Online]
Available at: http://www.agrimark.co.za/contact_us.htm
[Accessed 1 October 2013].

Agricultural Products Division, 2005. *Agricultural Derivatives celebrates 10 years of providing price risk management!,* Pretoria: Agricultural Products Division.

Baloch, U. K., 1999. *Wheat: Post-harvest Operations,* Islamabad: Pakistan Agricultural Research Council (PARC).

Bean, W. & Steyn, W., 2013. *The Potential Effects of Deteriorating Road Conditions in South Africa,* Pretoria: Universiteit van Pretoria.

Bester Feed & Grain, 2013A. *Derivative Trading.* [Online]
Available at: http://www.bester.co.za/derivative-trading
[Accessed 18 June 2013].

Bester Feed & Grain, 2013B. *Imports & Exports.* [Online]
Available at: http://www.bester.co.za/imports-exports
[Accessed June 2013].

Binkley, J., 1983. Marketing cost and instability in the international trade. *American Agriculture Economics Association,* 65(1).

BKB Grainco, 2013A. *BKB GrainCo Storage and Handling.* [Online]
Available at: http://www.grainco.co.za/storage.htm
[Accessed June 2013].

BKB Grainco, 2013B. *Silobags.* [Online]
Available at: http://www.grainco.co.za/silobags-eng.htm
[Accessed 7 November 2013].

BKB Logistics, 2013. *BKB Logistics.* [Online]
Available at: http://www.grainco.co.za/logistics.htm
[Accessed June 2013].

BKB, 2013. *BKB Corporate.* [Online]
Available at: http://www.bkb.co.za/Corporate/Show
[Accessed 16 November 2013].

Blanchard, O., 2009. *Macroeconomics.* 5th ed. New Jersey: Pearson Education.

Boonzaaier, J., 2009. *A Framework for the Improved Competitiveness of Resource Poor Farmer,* Stellenbosch: University of Stellenbosch (M.Sc Eng).

Borlaug, E. & Anderson, R., 1982. *Wheat in the third world.* Celo: Westview Press.

Bureau for food and agriculture policy, 2005. *The competitiveness of wheat production in the Western Cape, South Africa,* Pretoria: Aginfo Trading.

Business Monitor, 2011. *South Africa Infrastructure Report,* Pretoria: Business Monitor.

Chapman, G. & Hodges, G., 2011. *Wheat.* Mankato: Smart Apple Media.

Charles Sturt University, 2013. *Types of protection: tariffs, the economic theory.* [Online] Available at:
http://www.hsc.csu.edu.au/economics/global_economy/tut9/Tutorial9.html
[Accessed September 2013].

Commodity Trader, 2013. *Agricultural Commodity Trading Company* [Interview] (20 August 2013).

Competition Commission of South Africa, 2010. *Competition Commission settles with Pioneer Foods,* Pretoria: s.n.

Cronin, J., 2007. *The Future of Rail.* Johannesburg, Railways & Harbours Conference.

DASQ, 2012. *Agricultural Projects & Irrigation.* [Online]
Available at: http://dasq.net/page008.html
[Accessed 10 April 2012].

De Villiers, J., 2009. *Food security - a proposal for South Africa.* s.l.:s.n.

Department of Agriculture, Forestry and Fisheries, 2003A. *Analysis of selected food value chains.* Pretoria, Department of Agriculture, Forestry and Fisheries.

Department of Agriculture, Forestry and Fisheries, 2003B. *Consolidation of the regulations relating to the grading, packing and marking of wheat intended for sale in the republic of South Africa,* Pretoria: Department of Agriculture, Forestry and Fisheries.

Department of Agriculture, Forestry and Fisheries, 2005. *Wheat,* Pretoria: Department of Agriculture, Forestry and Fisheries.

Department of Agriculture, Forestry and Fisheries, 2009. *Wheat,* Pretoria: Department of Agriculture, Forestry and Fisheries.

Department of Agriculture, Forestry and Fisheries, 2010A. *Regulation related to the grading, packing and marking of Durum wheat intended for sale in the Republic of South Africa,* Pretoria: Department of Agriculture, Forestry and Fisheries.

Department of Agriculture, Forestry and Fisheries, 2010B. *Wheat: Production guidelines,* Pretoria: Department of Agriculture, Forestry and Fisheries.

Department of Agriculture, Forestry and Fisheries, 2012. *Wheat market value chain profile,* Arcadia: Department of Agriculture, Forestry and Fisheries.

Department of Rural Development and Land Reform, 2012. *Comprehensive Rural Development Programme,* Pretoria: Department of Rural Development and Land Reform.

Department: Performance Monitoring and Evaluation, 2012. *The State of South Africa's Economic Infrastructure:Opportunities and challenges.* s.l.:Development Bank of Southern Africa.

Doyer, O., D'Haese, M., Kirsten, J. & Van Rooyen, C., 1997. *Strategic focus areas and emerging trade arrangements in the South African agricultural industry since the demise of the marketing boards,* Pretoria: Agrekon.

Edwards, C., 2013. *Agricultural Subsidies.* [Online]
Available at: http://www.downsizinggovernment.org/agriculture/subsidies
[Accessed 21 September 2013].

Elg, U, Ghauri, P. N. & Tarnovskaya, V., 2008. The role of networks and matching in market entry to emerging retail markets. *International Marketing,* p. 25.

Emvula, S., 2012. *Assessment of hectolitre mass (HLM) equipment and HLM measurements of oats,* Stellenbosch: University of Stellenbosch.

Engelbrecht, M., 2008. *Assessment of variance in measurement of hectolitre mass of wheat and maize, using equipment from different grain producing and exporting countries,* Stellenbosch: University of Stellenbosch (M.Sc.Food Sciences).

Erasmus, D., 2013. *Farmers Weekly.* [Online] Available at:
http://www.farmersweekly.co.za/news.aspx?id=40335&h=Western%20Cape%20wheat%20farmers%20welcome%20winter%20rain
[Accessed 15 June 2013].

Erasmus, J. C. & Cownie, P. J., 2002. *Investigation into the development of small and medium sized bakeries in South Africa,* Pretoria: The Department of Trade and Industry.

EWG, 2013. *EWG Farm Subsidies.* [Online] Available at:
http://farm.ewg.org/progdetail.php?fips=00000&progcode=wheat
[Accessed 24 September 2013].

Exchange Rates UK, 2013. *Live Brent Oil Price in South African Rands.* [Online]
Available at: http://www.exchangerates.org.uk/commodities/live-oil-prices/BRT-ZAR.html
[Accessed 5 November 2013].

Field Crop Marketing, 2000. *Department of Agriculture, Forestry and Fisheries,* Pretoria: Department of Agriculture, Forestry and Fisheries.

Flatters, F., 2002. *Wheat flour in SADC: Rules of origin, tariff preferences and competition,* Gaborone: SADC TNF.

Former wheat producer and agricultural transporter, 2013. *Farm Morelug* [Interview] (16 October 2013).

Grain Chain, 2013. *Wheat into flour: The milling process.* [Online]
Available at: http://www.grainchain.com/Resources/11-14/ip_wheat-into-flour-the-milling-process
[Accessed 14 September 2013].

Grain SA, 2012. *Fertilizer Report,* Pretoria: Grain SA.

Grain SA, 2013A. *Fuel,* Pretoria: Grain SA.

Grain SA, 2013B. *Motivation for changes in the location differential system applicable to wheat production in the Western Cape Province,* Pretoria: Grain SA.

Grain SA, 2013C. *Wheat Model Swartland high rainfall,* Pretoria: Grain SA.

Havenga, J. H., 2007. *The development and application of a freight transport flow model for South Africa,* Stellenbosch: University of Stellenbosch.

Higgins, J., 2010. *Milling within the basic food production sectors: Innovative approaches in challenging issues of,* Johannesburg: African Micro Mills.

Hoepfl, M. C., 1997. Choosing Qualitative Research: A Primer for Technology. *Journal of Technology Education,* Issue 9, pp. 47- 63.

Index Mundi, 2013. *South Africa Wheat Domestic Consumption by Year.* [Online]
Available at:
http://www.indexmundi.com/agriculture/?country=za&commodity=wheat&graph=domestic-consumption
[Accessed 20 September 2013].

Inglett, G., 1974. *Wheat: production and utilization.* Westport: The AVI publishing company.

Kannemeyer, L., 2011. *Road Maintenance Standards,* Pretoria: Portfolio Committee on Transport.

Leedy, P. D. & Ormrod, J. E., 2008. *Practical Research:Planning and Design.* New Jersey: Prentice Hall.

Lima , M. S. & Gonzalez, P., 2013. *Argentine Wheat Surplus Seen Replacing Brazil Imports From U.S.* [Online] Available at: http://www.bloomberg.com/news/2013-09-26/argentine-wheat-surplus-seen-replacing-brazil-imports-from-u-s.html [Accessed 15 September 2013].

Logistics Manager, 2012. *Agricultural Marketing Company* [Interview] (September 2012).

Louw , A., Geyser, . M. & Troskie, G., 2010. *Determining the factors that limit agro-processing development in the wheat milling and baking industries in rural areas in South Africa,* Pretoria: National Agricultural Marketing Council.

Lynton-Evan, J., 1997. *Strategic grain reserves - Guidelines for their establishment, management and operation.* Rome: Food and Agriculture Organization of the United Nations.

Matthew, C., 2009. *Location Differentials in SAFEX Cash Market Settlement,* Pretoria: National Agricultural Marketing Council.

Metho, L. A., 1999. *Interaction between cultivar and soil fertility on grain yield, yield components and grain nitrogen content of wheat,* Pretoria: University of Pretoria.

Middelberg, S. L., 2013. Evaluating grain producers'. *Agricultural Finance Review,* Vol. 73(No. 2).

Ministerial Committee to Review Agriculture Marketing, 2006. *Report of the Committee to review the agricultural marketing environment,* Pretoria: Ministerial Commitee to Review Agriculture Marketing.

Mncuba, L., 2011. *The South African wheat flour cartel: Overcharges at the mill,* Stellebosch: University of Stellenbosch.

National Agricultural Marketing Council, 2009A. *Report on the section 7 committee investigation into the wheat-to-bread value chain,* Pretoria: Minister for Agriculture and Land Affairs.

National Agricultural Marketing Council, 2009B. *The Functioning of the Agricultural Futures market for grains and oilseeds in the light of concerns expressed by Grain SA,* Pretoria: National Agricultural Marketing Council.

National Agricultural Marketing Council, 2009C. *The Role of Transport in Logistics of Agriculture,* Pretoria: National Agricultural Marketing Council.

National Agricultural Marketing Council, 2010. *Input Cost Monitor: The Story of Maize and Wheat – An Update,* Pretoria: s.n.

National Crop Estimates Committee, 2013. *Wheat per province,* Pretoria: Grain SA.

National Freight Logistics, 2009. *National Freight Logistics Strategy.* Pretoria, National Freight Logistics.

Natural Resources Management and Environment Department, 2005. *Fertilizer use by crop in South Africa,* s.l.: Natural Resources Management and Environment Department.

Nsanganira, T. & Bancie, S., 2013. *Agricultural Business and Enterprises Development Services over the Last 50 Years and Vision for the Future,* s.l.: International Symposium on Agriculture – EAC Partner States at 50th anniversary of Independence.

O'Donovan, T. & O'Mahony, J., 2012. *Crops costs and returns,* s.l.: Agriculture and food development authority.

OECD Review of Agricultural Policies, 2006. *South Africa:Highlights and Policy Recommendations,* Paris: Organization for Economic co-operation and Development.

Orihuale, R., 2011. *Argentina Wheat Exports May Drop to Lowest in Decades.* s.l.:Bloomberg Businessweek.

Pioneer Foods, 2013. *Pioneer Foods:Our Roots.* [Online]
Available at: http://www.pioneerfoods.co.za/history/our_roots/default.asp
[Accessed 3 November 2013].

Plume, K. & Zabarenko, D., 2012. *Grain prices set records as U.S. drought, food worries spread.* [Online]
Available at: http://www.reuters.com/article/2012/07/20/us-usa-drought-

idUSBRE86F1D420120720
[Accessed 12 September 2013].

Richter, G., 2009. *Geskiedenis van die Koringbedryf.* 1st ed. Stellenbosch: Rapid Access.

SAFEX Agricultural Trading, 2013. *SAFEX Commodity Derivatives Market.* [Online]
Available at: http://www.jse.co.za/Markets/Commodity-Derivatives-Market.aspx
[Accessed 4 November 2013].

Silobag, 2012. *Storage bags for grain and forage.* [Online]
Available at:
http://www.silobag.com.au/home/index.php?option=com_content&task=view&id=25&Itemid=9
[Accessed 3 July 2012].

Silobags Systems, 2012. *Advantages of the System.* [Online]
Available at: http://www.silobag.co.za/
[Accessed 5 July 2012].

Silobags Systems, 2013. *Products.* [Online]
Available at: http://www.silobag.co.za/index.jsp?page=products
[Accessed 12 January 2013].

Simpson, Z. & Havenga, J., 2012. *Revitalisation of branch lines in South Africa: A long-term view for sustainability,* Stellenbosch: University of Stellenbosch.

Smith, V. H., 2013. *The 2013 Farm Bill:Limiting Waste by Limiting Farm-Subsidy Budgets,* Arlington: George Mason University.

South Africa Info, 2012. *South Africa in massive freight rail drive.* [Online]
Available at:
http://www.southafrica.info/business/economy/infrastructure/transnet-110412.htm
[Accessed 24 May 2012].

South African Chamber of Baking, 2013. *The bread industry in South Africa.* [Online]
Available at: http://www.sacb.co.za/webroot/main/history_of_bread.html
[Accessed 12 September 2013].

South African Grain Information Service, 2013A. *Maize and wheat by transport component,* Pretoria: South African Grain Information Service.

South African Grain Information Service, 2013B. *Wheat-Imports-Exports,* Pretoria: South Africa Grain Information Services.

Summer, D., 2013. *Agricultural Subsidy Programs.* [Online]
[Accessed http://www.econlib.org/library/Enc/AgriculturalSubsidyPrograms.html September 2013].

The African Business Journal, 2013. *Tiger Milling Company.* [Online]
Available at:
http://www.tabj.co.za/food_drink/tiger_milling_company_flour_luminaries_set_sights_on_continued_e.html
[Accessed 5 October 2013].

The National Chamber of Milling, 2005. *The strategic plan for the South African grain industry.,* Centurion: The National Chamber of Milling.

The South African National Roads Agency SOC Limited, 2012. *Strategic Plan 2012/2013 – 2016/2017,* Pretoria: The South African National Roads Agency SOC Limited.

The Wheat Steering Committee, 2002. *Strategy document for the South African wheat to bread value chain,* s.l.: The Wheat Steering Committee.

Transnet, 2007. *Presentation of Transnet National Ports Authority to Inter- regional workshop of African Ports.* Barcelona, Spain.

Tsengiwe, S., 2013. *Import Tariff Setting Agricultural Products,* Pretoria: International Trade Administration Commission of South Africa.

University of Saskatchewan, 2013. *Winter Cereal Production.* [Online]
Available at: http://www.usask.ca/agriculture/plantsci/winter_cereals/winter-wheat-production-manual/chapter-23.php#kernel
[Accessed 11 November 2013].

Van Burick, N. & Smith, M., 2004. *Vervoer kwessie ondersoek.* [Online]
Available at: http://www.landbou.com/nuus/nuus-artikel/vervoer-kwessie-ondersoek [Accessed 22 June 2012].

Van der Vyfer, A. & Nordier, A., 2013. *Adjustment of the wheat import tariff and the effect on the local market,* Pretoria: SA Grain.

Van Schalkwyk, S., 2008. *Suffer the wheat farmer.* s.l.:Mail & Guardian.

Venter, B., 2005. *Inferior imported wheat a concern for farmers.* [Online]
Available at: http://www.iol.co.za/news/south-africa/inferior-imported-wheat-a-concern-for-farmers-1.227604?ot=inmsa.ArticlePrintPageLayout.ot
[Accessed 13 June 2013].

Viljoen, J., 2012. *Grain and its storage.* [Online]
Available at: http://mask-africa.com/FarmAcademy/grain-and-its-storage/
[Accessed 12 June 2012].

Vink, N. & Kirsten, J., 2002. *Deregulation of agricultural marketing in South Africa: Lessons learned,* Johannesburg: The Free Market Foundation.

Visser, H., 2010. *Farmex.* [Online] Available at: http://www.farmex.co.za/node/6
[Accessed 5 June 2013].

Westfall, D. G. & Davis, J. G., 2013. *Fertilizing Winter Wheat.* [Online]
Available at: http://www.ext.colostate.edu/pubs/crops/00544.html
[Accessed 26 November 2013].

Wheat producer 1, 2013. *Farm Brakfontein* [Interview] (11 July 2013).

Wheat producer 2, 2013. *Farm Schoongezicht* [Interview] (18 April 2013).

Wheat producer 3, 2013. *Farm Jakkalsfontein* [Interview] (12 September 2013).

Wheat producer 4, 2013. *Farm Wadrift* [Interview] (11 April 2013).

Wheat producer 5, 2013. *Farm Perdedam* [Interview] (11 July 2013).

Wheat producer 6, 2013. *Farm Swartheuwel* [Interview] (12 October 2013).

Wheat producer 7, 2013. *Farm Nuweput* [Interview] (28 December 2013).

World Bank, 2013. *World Bank Indicators - south africa - Population.* [Online]
Available at: http://www.tradingeconomics.com/south-africa/population-growth-annual-percent-wb-data.html
[Accessed 20 September 2013].

World Trade Organization, 2013. *Agriculture: Fairer markets for farmers.* [Online] Available at: http://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm3_e.htm [Accessed September 2013].

ANNEXURE A

2012-2013 SILO LOCATION DIFFERENTIALS

2012-2013 Silo Location differentials

(Complete document and more information obtainable from www.jse.co.za)

SILO	LOC. DIFF. R/TON	SILO OWNER	SILO	LOC. DIFF. R/TON	SILO OWNER
Afrikaskop	225	AFG	Hartbeesfontein	149	SWK
Albertinia	420	TAB	Hartswater	224	SWK
Allanridge	199	SWK	Heidelberg	420	SSK
Alma *	228	NTK	Heilbron	139	SWK
Amersfoort *	227	AFG	Hennenman	190	SWK
Arlington	202	SWK	Heuningspruit	155	SWK
Ascent	201	VRY	***Hibernia*** **	159	NWK
Ashton	420	SSK	Hoogte	155	SWK
Balfour	131	AFG	Jan Kempdorp	224	SWK
Barkley West	243	GWK	Kaallaagte	212	AFG
Battery	79	MGK	Karringmelkrivier	420	SSK
Beestekraal *	139	BKB	Klipdale	420	OAB
Bergrivier	420	MKB	Klipheuwel	420	KAA
Bergville	237	AFG	Koperfontein	420	MKB
Bethlehem	221	AFG	Koppies	138	SWK
Bloedrivier	287	AFG	Koringberg	420	MKB
Bloemfontein	231	SWK	Koster	121	NWK
Bloemhof	191	SWL	Kransfontein	225	AFG
Bothaville	163	SWK	Krige	420	OAB
Brandfort	223	SWK	Kroonstad	163	SWK
Bredasdorp	420	OAB	Leeudoringstad	183	SWL
Brits	111	MGK	**Leeuspruit ***	139	AFG
Bronkhorstspruit	130	AFG	**Lehau ***	165	NTK
Buhrmannsdrift	203	NWK	Leliedam	420	MKB
Bultfontein	216	SWK	Libertas	206	AFG
Caledon	420	OAB	Losdoorns	200	SWK
Camfer	420	TAB	Lydenburg	231	AFG
Ceres *	420	KAA	Magogong	232	SWK
Christiana	214	SWL	**Maizefield ***	191	AFG
Clocolan	238	OVK	**Malmesbury ***	420	KAA
Danielsrus	202	VRY	**Marble Hall ***	188	AFG
Dannhauser	243	AFG	Marquard	230	AFG
Darling	420	KAA	Marseilles	247	OVK
Davel	191	AFG	Meets	220	AFG
De Brug	250	SWK	**Melkboom ***	420	BKB
Delareyville	197	NWK	Mispah	335	AFG
Delmas	115	SCH	Modderpoort	240	OVK
Dryden	129	AFG	Modderrivier	256	GWK
Eendekuil	420	KAA	Monte Video	225	AFG
Eeram	225	AFG	Mooigelee	190	SWK
Eloff	122	AFG	Moorreesburg	420	BFG
Ficksburg	237	OVK	Moorreesburg	420	MKB
Fouriesburg	217	OVK	Moravia	420	MKB
Frankfort	168	VRY	**Morgenzon ***	197	AFG
Geneva	181	SWK	Naboomspruit	187	NTK
Goeiehoek *	115	AFG	Napier	420	OAB
Gouda	420	KAA	Nigel	105	AFG
Graafwater	420	KAA	Northam	179	MGK

Grootvlei *	139	AFG	**Nutfield ***	194	NTK
Halfmanshof	420	KAA	NWK Kameel	229	NWK
Halfpad	141	NWK	Nylstroom	169	NTK
Harrismith	227	AFG	Oberholzer	87	SWK
***** Additional R5/t included - Notice A1008A***					
SILO	**LOC. DIFF. R/TON**	**SILO OWNER**	**SILO**		**SILO OWNER**
Odendaalsrus	201	SWK	Vermaas	169	NWK
Oranjerivier	289	OVK	Vierfontein	145	SWK
Paulpietersburg	240	AFG	Viljoenskroon	151	SWK
Petrus Steyn	170	VRY	Villiers	145	VRY
Petrusburg	279	SWK	**Vrede ***	197	VRY
Piketberg	420	KAA	Vryburg	230	SWL
Pools	420	KAA	Vryheid	281	AFG
Porterville	420	KAA	Warden	213	VRY
Potgietersrus	233	NTK	Warmbad	159	NTK
Pretoria West	100	MGK	Welgelee	196	SWK
Protem	420	OAB	Wesselsbron	212	SWK
Protem	420	SSK	Westminster	268	OVK
Protespan	221	SWK	Willemsrust	198	SWK
Raathsvlei	87	SWK	**Winburg ***	223	SWK
Reitz	192	VRY	Winterton	234	AFG
Riebeek Wes	420	KAA	Wolwehoek	112	SWK
Rietpoel	420	OAB	Wonderfontein	197	AFG
Riversdal	420	TAB			
Robertsdrift *	162	BKB			
Roedton *	219	NTK			
Rooiwal	140	SWK			
Ruststasie	420	KAA			
Senekal	225	AFG			
Settlers *	164	NTK			
Slabberts	217	AFG			
Steynsrust	191	SWK			
Stoffberg	210	AFG			
Strydpoort	166	SWL			
Swartruggens	139	NWK			
Swellendam	420	SSK			
SWL Kameel	230	SWL			
SWL Migdol	196	SWL			
Theunissen	214	SWK			
Tierfontein	227	SWK			
Tweeling	188	VRY			
Tweespruit	256	OVK			
Van Tonder	226	SWK			
Ventersdorp	109	SWK			